

Vehicle Emissions Discussion Paper



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Submissions close on 8 April 2016.

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1. Introduction

Emissions from motor vehicles can affect our health by polluting the air we breathe and can also contribute to climate change. To explore options to reduce the environmental and health impacts of emissions from motor vehicles, the Australian Government has established a Ministerial Forum to coordinate a whole of government approach to this important issue.

The Ministerial Forum is chaired by the Minister for Major Projects, the Hon Paul Fletcher MP, and membership includes the Minister for the Environment, the Hon Greg Hunt MP and the Minister for Resources, Energy and Northern Australia, the Hon Josh Frydenberg MP.

The Ministerial Forum brings together the infrastructure, environment and energy portfolios and a range of Commonwealth commitments including the National Clean Air Agreement and measures to deliver Australia's carbon emissions reduction and energy productivity targets, including the Direct Action Plan and the National Energy Productivity Plan. Information on current Australian Government initiatives relevant to the work of the Forum is at **Appendix 1**.

The Ministerial Forum is supported by an interdepartmental working group led by the Department of Infrastructure and Regional Development.

The working group will report by 30 June 2016 to the Ministerial Forum on measures to reduce noxious and carbon dioxide (CO_2) emissions from the road transport sector. This will be followed by consultation in the second half of 2016 on draft regulation impact statements (RIS) for noxious emissions standards and fuel efficiency (CO_2) measures that will present a full cost benefit analysis of options. The working group will report by 31 March 2017 to the Ministerial Forum on a draft implementation plan for new measures—aligning with the Australian Government's commitment to announce new measures to deliver Australia's 2030 climate change targets.

Terms of reference for the work of the Ministerial Forum and working group are at Appendix 2.

1.1 Purpose of Discussion Paper

This discussion paper has been released to seek views on measures to achieve the Australian Government's 2030 greenhouse gas emissions reduction target of 26-28 per cent on 2005 levels by 2030, the air quality objectives of the National Clean Air Agreement, and the National Energy Productivity Plan (NEPP) objective of a 40 per cent improvement in energy productivity by 2030. In line with the Ministerial Forum's terms of reference, the focus of this paper is on road vehicles.

The discussion paper has been informed by views raised by vehicle manufacturers, transport operators, consumer groups and health and environment groups at a meeting held by Minister Fletcher on 7 December 2015.

The paper explores issues associated with the implementation of more stringent standards for noxious air pollutant emissions (the 'Euro' standards) and a standards regime for fuel efficiency (CO_2). Also considered in this paper are complementary or stand-alone measures to address vehicle emissions.

The paper includes a range of questions to guide stakeholder input. A list of abbreviated forms and a glossary are at **Appendix 3**, with a complete list of questions at **Appendix 4**.

Submissions received will inform the development of draft RIS on noxious emissions and fuel efficiency (CO₂) measures. These RIS will include a full cost benefit analysis of the potential impacts, with relevant stakeholders being consulted throughout their development.

Submissions should be emailed to: <u>vemissions@infrastructure.gov.au</u>.

All submissions received will be published on the Ministerial Forum's website at https://infrastructure.gov.au/roads/environment/forum/index.aspx unless a specific request for confidentiality is made. In this case, please indicate whether you wish your entire submission to be confidential or just your identity.

The closing date for submissions is <u>8 April 2016</u>.

2. Why do we need to explore reducing vehicle emissions in Australia?

Emissions from motor vehicles can have a significant impact on human health and the environment. They can be broadly categorised into two types – noxious emissions and greenhouse gas emissions.

2.1 Noxious Emissions

Noxious (air pollutant) emissions have an impact on the quality of the air we breathe, by contributing to the formation of smog in cities and adverse health effects such as respiratory illness, cardiovascular disease and cancer.

Contribution of motor vehicles to noxious emissions

Noxious emissions from road vehicles include carbon monoxide, hydrocarbons, oxides of nitrogen and particulate matter. These emissions are generally the result of imperfect engine combustion, but can also be influenced by the fuel used in the combustion process. Noxious emissions can also occur through the evaporation of fuel when an engine is hot or the ambient temperature is high. Noxious emissions from vehicles are generally controlled and mitigated through the adoption of technologies such as catalysts and particulate filters.

While motor vehicles are not the sole contributor of noxious emissions in Australia, they are the main contributor to emissions of oxides of nitrogen in Australian cities and a significant contributor to emissions of hydrocarbons. Both of these gases can lead to the formation of photochemical smog (ozone) in hot and sunny weather conditions, leading from time to time to instances of air quality in capital cities falling below agreed air quality standards.

In Australia, light petrol vehicles are the main transport contributors to these emissions, but diesel vehicles tend to produce oxides of nitrogen at a higher rate per vehicle relative to petrol vehicles (and are permitted to do so under current vehicle emissions standards).

While motor vehicles are not the largest source of particle emissions in most urban airsheds¹, they are still a significant contributor.

Linkages between noxious and greenhouse gas emissions

Noxious emissions from road vehicles are generally not in themselves a significant contributor to climate change. However, measures to reduce vehicle CO_2 emissions can affect noxious emissions, and conversely, technologies for reducing noxious emissions can affect fuel efficiency and CO_2 emissions.

Ensuring cleaner air in the future

While Australia's air quality is considered good by international standards our increasingly urbanised and ageing population may be more susceptible to the health impacts of noxious emissions. This is particularly pertinent when considering that in 2012, 66 per cent of Australians lived in a capital city and that the combined population of our four largest cities is projected to increase by around 45 per cent (5.8 million people) to 18.6 million by 2031.²³

Taking steps to improve Australia's air quality now, by reducing noxious emissions from road vehicles, will assist future generations in maintaining Australia's good air quality.

2.2 Carbon dioxide (CO₂) emissions

At present, energy use and CO₂ emissions are closely linked for the transport sector, as fossil fuels are the principal form of fuel for transport in Australia. In 2014-15, domestic transport was the second largest energy user in Australia (behind electricity generation), and accounted for around 17 per cent of Australia's greenhouse emissions in 2013-14,^{4 5} with approximately 60 per cent of transport sector emissions coming from light vehicles. Globally, the transport sector accounts for approximately 14 per cent of greenhouse gas emissions.⁶

As Australia's population and economy grows, so will its transport sector, potentially leading to increased energy usage and emissions. Transport is projected to be Australia's main form of energy usage by 2035,⁷ with total emissions from the transport sector also predicted to increase during this period.⁸

¹ An airshed is a body of air, bounded by meteorology and topography, in which substance emissions are contained. Department of the Environment (2011), State of the Environment Report.

² Australian Bureau of Statistics (2013) 3222.0 - Population Projections, Australia. Accessed at:

⁴ Bureau of Resources and Energy Economics (BREE), Australian Energy Projections to 2049-50, November, pp32.

⁵ Department of Environment (2015) Australians Emissions Projections 2014-15, pp19.

⁶ Intergovernmental Panel on Climate Change (IPCC) (2014), *Mitigation of Climate Change – Summary for Policymakers*. Fifth Assessment Report (AR5), Working Group III. Accessed at: http://www.ipcc.ch/report/ar5/wg3/second-accessed (AR5), Working Group III. (Accessed III) (Acc

⁷ Bureau of Resources and Energy Economics (BREE), Australian Energy Projections to 2049-50, BREE, pp32.

⁸ Department of Environment (2015) Australia's Emissions Projections 2014-15, pp19.

Reducing CO_2 emissions mitigates the impact of climate change whilst also reducing costs for households and businesses and improving Australia's energy productivity. A 2014 Climate Change Authority Report found that a fuel efficiency standard with a comparable target to the United States' (US) target for 2025 would provide motorists around \$8,500 in fuel savings over the life of the vehicle.

Improvements in the energy efficiency of transport can also yield significant productivity gains for industry and better economic performance more broadly. On average, it will take Australian businesses and motorists less fuel to drive further, leading to less overall fuel costs. However any ongoing or systematic failure to make energy efficiency gains will make Australian goods less competitive and increase living costs for consumers (compared to other countries that have introduced fuel efficiency measures).

Currently, Australia is the world's 13th largest emitter, accounting for 1.3 per cent of global CO₂ emissions.⁹ In announcing its 2030 emissions reduction target, the Australian Government committed to consult on and implement initiatives that can deliver low cost emissions reductions and other co-benefits, including measures to improve light vehicle fuel efficiency. Indicative analysis suggests that measures to reduce emissions from the transport sector will make a significant contribution towards the 2030 target, as shown below.



Figure 1: Indicative Emissions reduction sources 2020 to 2030¹⁰

Source: Department of the Environment; chart represents indicative estimates. Actual emissions reductions will depend on final policy design, and the amount of emissions reductions required to meet Australia's 2030 target will depend on future emissions trends.

⁹ Australian Government (2015), Setting Australia's Post-2020 Target for Reducing Greenhouse Gas Emissions - Final Report of the UNFCCC Taskforce, pp5.

This figure has been adapted from Figure 3: Indicative emissions reduction sources, 2020 to 2030, in the fact sheet Australia's abatement task: tracking to 2020, Department of Environment (2015) Australia's 2030 climate change target. Accessed from:

<.https://www.environment.gov.au/system/files/resources/8443e0d0-e823-43dd-8b99-5e2996dfafb1/files/factsheet-australias-abatement-task.pdf>

Additionally, economic modelling by ClimateWorks in 2011 indicates that the most cost effective abatement opportunities for all major emitting sectors are in the transport sector.





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

3. State of Play – How is Australia reducing these emissions?

3.1 Noxious Emissions

Australia has had noxious emissions standards for new vehicles in place since the early 1970s and these have been progressively strengthened over the past 40 years, as both technology and international understanding of the health impacts of noxious emissions have improved.

It is generally accepted that an increasing proportion of vehicles meeting tighter noxious emissions standards and the introduction of fuel standards under the *Fuel Quality Standards Act 2000* has played a major part in air quality improvements in Australian cities since the early 2000s.

¹¹ ClimateWorks Australia (2014) *Improving Australia's light vehicle fuel efficiency – Briefing Paper 2014,* p5.

The noxious emissions standards adopted in Australia reflect Australia's commitment as a signatory to the United Nations (UN) 1958 Agreement on vehicle standards development and testing,¹² which provides for mutual recognition where UN Regulations are applied or accepted. While this agreement does not oblige Australia to adopt UN Regulations, the Australian Government's preferred approach is to adopt UN Regulations where possible, as this helps facilitate international trade and minimises compliance costs, while ensuring a high level of safety and environmental performance. The current UN Regulations for noxious emissions are based on the 'Euro' standards adopted in the European Union (EU), and form the basis of noxious emissions standards in many other countries.¹³

For petrol, diesel and gaseous fuelled light vehicles (up to 3.5 tonnes gross vehicle mass).¹⁴ Australia has mandated the 'Euro 5' noxious emissions standards for newly approved vehicle models first produced from 1 November 2013,¹⁵ and these requirements will apply to all new vehicles produced from 1 November 2016. The Euro 5 standards for light vehicles reduce emission limits for oxides of nitrogen by up to 30 per cent and emission limits for particulate matter for diesel vehicles by up to 90 per cent relative to the Euro 4 standard.

For diesel and gaseous fuelled heavy vehicles (gross vehicle mass over 3.5 tonnes) Australia has mandated the 'Euro V' noxious emissions standards for all heavy vehicles manufactured from 1 January 2011, with vehicles that comply with equivalent US and Japanese standards also accepted. 16 17

Motor Vehicle Standards Act 1989

The 'Euro' noxious emissions standards are adopted as Australian Design Rules under the Motor Vehicle Standards Act 1989 which provides the legislative basis for Australia to set vehicle design and performance standards for safety and environmental performance. Under the Act and the Motor Vehicle Standards Regulations 1989 (the Regulations), the Australian Government maintains a system that generally requires road vehicles to meet national design and performance standards - Australian Design Rules (ADRs) - before they can be supplied to the Australian market. The ADRs set requirements for vehicle safety, environmental performance and anti-theft protection in line with community expectations and international standards.

¹² Full name of the 1958 Agreement - Agreement concerning the adoption of uniform technical prescriptions for wheeled vehicles, equipment and parts which can be fitted and/or be used on wheeled vehicles and the conditions for reciprocal recognition of approvals granted on the basis of these prescriptions.
¹³ transportpolicy.net (2014) Global Comparison: Heavy-duty Emissions. Accessed at:

<a>http://transportpolicy.net/index.php?title=Global_Comparison:_Heavy-duty_Emissions> [29 January 2016].

¹⁴ Light vehicles include cars, sports utility vehicles, people movers, small buses, and light commercial vehicles such as vans and utes/light trucks, but do not include motorcycles.

Arabic numerals are used to designate standards for light vehicles (e.g. Euro 5).

¹⁶ Heavy vehicles (GVM over 3.5t) include the largest vans and utes/pickup trucks, as well as rigid trucks, buses and prime movers used in articulated vehicle combinations. ¹⁷ Roman numerals are used to designate standards for heavy vehicles (e.g. Euro V).

How does this compare internationally?

Australia's noxious emissions standards are less stringent than those in comparable countries, Euro 6 emissions standards for light vehicles became mandatory in Europe from September 2014 and equivalent standards are currently in force in the US and Japan. The Euro VI emissions standards for heavy vehicles commenced in Europe at the end of 2012, with equivalent standards fully implemented in the US and Japan in 2010.¹⁸

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

Figure 3. Euro 5 and 6 Light Passenger Vehicle Emissions Limits (mg/km)

Figure 4. Euro 5 and 6 Light Commercial Vehicle Emissions Limits (mg/km)

| Level | _evel Euro 5 | | Euro 5 | | Euro 6 | |
|--------------------|---|--------|---|--------|--------|--|
| Emission | Petrol/LPG | Diesel | Petrol/LPG | Diesel | | |
| Oxides of Nitrogen | 82 | 280 | 82 | 125 | | |
| Particulates | 4.5 (for direct injection petrol engines) | 4.5 | 4.5 (for direct injection petrol engines) | 4.5 | | |

Figure 5. Euro V and VI Emissions limits for heavy diesel vehicles (mg/kWh)

| Level | Euro V | | Euro VI | |
|--------------------|---------------------|--------------------|---------------------|--------------------|
| Emission | Stationary Cycle | Transient Cycle | Stationary Cycle | Transient Cycle |
| Oxides of Nitrogen | 2,000 | 2,000 | 400 | 460 |
| Particulates | 20 | 30 | 10 | 10 |

¹⁸ Dieselnet Emission Standards (2015) Heavy-Duty Engines. Accessed at: https://www.dieselnet.com/standards/jp/hd.php> [29 January 2016].

3.2 Fuel Efficiency (CO₂)

3.2.1. Light vehicle fuel efficiency (CO₂)

The primary mechanism that the Australian Government has sought to improve fuel efficiency and reduce CO_2 emissions from light vehicles is through educating and informing consumers.

This is done through the mandatory fuel consumption label, which requires all new light vehicles to display a removable label providing information on a vehicle's fuel consumption and CO_2 emissions on the vehicle's windscreen at point of supply to the Australian market (Figure 6).

Figure 6: Fuel Consumption Label



The figures displayed on the fuel consumption labels are based on standardised tests conducted in carefully controlled conditions in specialised vehicle emission laboratories. Although no test can simulate all 'real world' conditions, labelling does provide a common basis for comparison of individual vehicle models.

The Department of Infrastructure and Regional Development also administers the Green Vehicle Guide website (<u>www.greenvehicleguide.gov.au</u>), which has provided information on the fuel consumption and emissions performance of light vehicles sold in Australia since 2004.

To encourage the purchase of more efficient vehicles, the Australian Government also applies a higher threshold when applying the luxury car tax to fuel efficient vehicles (see **Section 5.4** for more detail). The Emissions Reduction Fund also provides incentives for projects that reduce vehicle emissions by replacing or modifying vehicles, switching to alternative fuels, or change how vehicles are operated (see **Appendix 1**). In addition, the Clean Energy Finance Corporation also provides assistance to support the uptake of low emission vehicles (see **Appendix 1**).

Fuel Efficiency

Fuel efficiency is effectively how much fuel a vehicle uses per kilometre. Improving the efficiency of a vehicle means it uses less fuel to travel the same distance and is a primary way to reduce vehicle CO_2 emissions.

The preferred measure for vehicle fuel efficiency is in terms of grams of CO_2 emitted per kilometre (g/km). This ensures all fuel types are treated in an equitable manner and recognises the broader environmental benefits of improved fuel efficiency. Some fuels, such as diesel, have a higher energy content and may go further in terms of kilometres per litre of fuel, but also produce more CO_2 per litre of fuel consumed. Other fuels such as Liquefied Petroleum Gas (LPG), have lower energy content and may not go as far in terms of kilometres per litre, but produce less CO_2 per litre of fuel consumed.

Overall in Australia, annual CO_2 emissions reductions continue to be delivered in the new vehicle fleet, from 247g/km in 2004 to 188 g/km in 2014 (NB: the 188 g/km is an average of 177g/km for passenger vehicles and 235g/km for light commercial vehicles).¹⁹

The historical data on new vehicle purchases in Australia suggests that it is reasonable to expect that CO_2 emissions from new light vehicles, on average, will continue to improve under a business as usual scenario, although not at the rates in other countries where mandatory standards and other measures are in place. Initial research by the Bureau of Infrastructure, Transport and Regional Economics has found the average CO_2 emission intensity of light vehicle sales is forecast to decline to a level of between 155-160 g/km by 2025. Under this scenario, Australia does gain moderate advantages over time from overseas fuel economy standards, as more imported vehicles incorporate technologies aimed at meeting the fuel efficiency (CO_2) standards adopted in other markets.

How does this compare internationally?

In the US the fuel efficiency (CO₂) standard for its new passenger vehicle fleet in 2016 is equivalent to 151g/km.²⁰ The EU passenger vehicle fleet standard for 2015 is 130g/km. The following graph (Figure 7) compares Australia's current and projected light (passenger and commercial) vehicle CO_2 emissions, which demonstrates that Australia is projected to fall behind the EU and the US. A key factor in this is that both the US and the EU have introduced fuel efficiency (CO₂) standards.

The 2014 American Council for an Energy-Efficient Economy (ACEEE) International Scorecard ranked Australia last out of 16 major OECD countries for the energy efficiency of the transport sector.²¹

²⁰The US uses a different test cycle to the EU and Australia for measuring fuel consumption and emissions. To enable consistent comparisons between the US and the EU, for the purposes of this discussion, the US target has been adjusted in accordance with the International Council for Clean Transport's NEDC normalisation methodology. See International Council for Clean Transportation, Info and Tools, Global Passenger Vehicle Standards. Accessed at: 114">http://titro.tops/clobal-passenger-vehicle-standards>114. January 2016 1

¹⁹ National Transport Commission, Carbon Dioxide Emissions Intensity for New Australian Light Vehicles 2014 Information paper, April 2015.

²¹ American Council for an Energy-Efficient Economy (ACCEE) (n.d) Australia. Accessed at: http://aceee.org/files/pdf/country/australia.pdf> [18 January 2016].

Figure 7: Tested Average Light (Passenger and Commercial) Vehicle CO_2 Emissions: EU, US and Australia



Source: Bureau of Infrastructure, Transport and Regional Economics (BITRE)

3.2.2 Heavy vehicle fuel efficiency

Internationally, through the International Partnership for Energy Efficiency Cooperation (IPEEC) Transport Energy Efficiency Task Group, Australia is involved in implementing the G20 Energy Efficiency Action Plan, which aims to reduce the energy impact of motor transport, particularly heavy vehicles. More detail on the G20 Action Plan can be found at **Appendix 1**.

Heavy vehicle fuel efficiency improvements are being made through Australia's Performance Based Standards (PBS) scheme, which is the responsibility of the National Heavy Vehicle Regulator. The PBS scheme aims to increase the freight productivity of heavy vehicles in Australia. The objectives of the scheme also include reducing the impact on the environment with regard to vehicle emissions (through efficiency in road use).

How does this compare internationally?

Some countries, such as the US, Canada, China and Japan have recently adopted national standards for heavy vehicle efficiency. These standards tend to be more complex than those for light vehicles, as they rely on a combination of engine based testing and simulation. This is because heavy vehicle emissions are tested at an engine level rather than a whole vehicle level, as heavy vehicles can be used in a wider range of configurations beyond the control of the manufacturer. As these standards are relatively new, there is yet to be international consensus on a standard for measuring heavy vehicle efficiency at an individual vehicle level.

The Australian Government will use the G20 collaboration on heavy vehicle efficiency as an opportunity to learn from the experience of countries that have adopted standards for heavy vehicle efficiency and consider whether these measures may be appropriate for improving the efficiency of the Australian heavy vehicle fleet.

3.2.3 Motorcycles

There are currently no standards that regulate noxious or greenhouse gas emissions from motorcycles in Australia. Motorcycles account for less than one per cent of total vehicle kilometres travelled and are estimated to account for a comparable share of vehicle emissions.²²

How does this compare internationally?

Standards regulating noxious emissions for motorcycles have been adopted in the US, EU, Japan, Canada, China, Korea, India and Vietnam, with China the only country to have adopted standards for motorcycle efficiency (CO_2) .²³

As most motorcycles sold in Australia are imported from countries with standards, it is likely that some motorcycles sold in Australia have been designed to meet standards that apply in these countries. Further understanding of the emission levels of the current motorcycle fleet would be required in order to determine the costs and benefits of adopting noxious and fuel efficiency (CO_2) standards in Australia.

Fuel Quality Standards 3.3

The composition of fuels can directly affect noxious and CO₂ emissions from road transport. It can also influence the range of technologies that can be adopted to improve vehicle efficiency and emissions.

Australia currently sets fuel standards for petrol, automotive diesel, autogas (liquid petroleum gas), biodiesel and ethanol (E85) under the Fuel Quality Standards Act 2000, which is administered by the Australian Government Department of the Environment. Fuel quality is regulated to reduce pollutants and emissions that can contribute to environmental and health problems, namely carbon monoxide, nitrogen oxides, sulfur oxides, volatile organic compounds and particulate matter.

The principal fuel quality parameter that is regulated to control noxious vehicle emissions is sulfur content, which can affect the durability and operation of emission control systems such as catalysts and particulate filters.²⁴ The current standard for automotive diesel has a sulfur limit of 10 parts per million (ppm). The current standard for petrol sets the maximum petrol sulfur limits at 150 ppm for 'regular' unleaded petrol (91 Research Octane Number (RON)) and 50 ppm for 'premium' unleaded petrol (95+ RON).

 ²² Australian Bureau of Statistics (2015) 9208.0 - Survey of Motor Vehicle Use, Australia, 12 months ended 31 October 2014.
 ²³ Transportpolicy.net (2012) Motorcycles. Accessed at: http://transportpolicy.net/index.php?title=Categorys [29 January 2016]

²⁴ International Council for Clean Transportation (ICCT) (2015) Briefing Paper- Policies to Reduce Fuel Consumption and Air Pollution and Carbon Emissions from vehicles in G20 nations, May 2015.

How does this compare internationally?

Australia meets international best practice for sulfur limits in automotive diesel.

Most developed countries have now adopted fuel quality standards that limit sulfur content in petrol to 10 ppm. While Australia continues to sell 91 RON petrol, the minimum standard adopted for petrol in the EU is 95 RON. Most European light vehicle manufacturers specify the use of 95 RON fuel for vehicles sold in Australia.

According to Stratas Advisors, a global consulting and advisory firm covering energy and related industries, this ranks Australian petrol quality based on sulfur limits at 63 in the world; with only Mexico having worse petrol quality in the OECD. In comparison, New Zealand has a sulfur limit of 50 ppm for all grades of petrol.²⁵ However, caution should be taken with such comparisons, as they are based on regulated sulfur limits rather than the actual sulfur content of fuels sold in these countries.

4. Options to reduce vehicle emissions

4.1 Implementation of Euro 6/VI Noxious Emissions Standards for Light and Heavy Vehicles

Most developed countries have now adopted noxious emissions standards based on, or equivalent to, the international Euro 6 emissions standards for light vehicles and the Euro VI emission standards for heavy vehicles.

Compared to the Euro 5 standard, the Euro 6 standard reduces noxious emission limits for oxides of nitrogen for diesel vehicles by a further 55 per cent and also adopts limits to address ultrafine particles from petrol vehicles with direct injection fuelling systems.

The adoption of a more stringent noxious emissions standard will likely require manufacturers to incorporate additional technologies in vehicles to reduce noxious emissions, with any additional manufacturing costs potentially passed on to consumers. Light vehicle manufacturers have also raised concerns that in the absence of any changes to Australian fuel quality standards for petrol, current standards may affect the performance and durability of emissions control systems.

The Australian Government notes that some manufacturers already offer vehicles meeting the Euro 6 noxious emissions standards to the Australian market. The performance of these vehicles using current fuel in Australia may help provide some level of insight as to what extent more stringent standards would affect vehicle performance, productivity and durability under current fuel quality standards.

²⁵ Engine Fuel Specifications Regulations 2011 (NZ), Schedule 1, Requirements for petrol Accessed at: http://www.legislation.govt.nz/regulation/public/2011/0352/latest/whole.html#DLM4044783 [14 January 2016]

The Euro VI standards for heavy vehicles reduce emission limits for oxides of nitrogen by up to 80 per cent and emission limits for particulate matter by up to 66 per cent relative to the current Euro V standard. The Euro VI standards also adopt a particle number limit to reduce ultrafine particles and a new test cycle.

Stakeholders in the heavy vehicle sector have raised concerns that more stringent noxious emissions standards may affect the way a vehicle can operate, as more advanced and complex emissions control technology could affect a vehicle's power output, legal payload, or durability in Australian conditions, particularly in rural and remote areas. This may require manufacturers to invest in further research and development to ensure the technology required to meet these standards is fit for purpose in Australian operating conditions. Further analysis may be required to understand the significance of these issues.

Questions

- 1. What are the likely costs and benefits of adopting Euro 6 emissions standards for light vehicles and/or Euro VI emission standards for heavy vehicles?
- 2. If Euro 6/VI standards were adopted, when would be an appropriate start date and why?
- 3. To what extent do current Australian fuel quality standards limit the adoption/import of existing technologies and models that meet Euro 6 specifications?
- 4. Are there other ways governments could encourage the purchase and supply of vehicles that meet Euro 6/VI emissions standards?
- 5. What measures could governments adopt to ensure vehicles continue to comply with noxious emission requirements beyond the point of supply to the market?
- 6. Should the Australian Government conduct a review to consider whether noxious emissions standards for motorcycles should be adopted in Australia?

4.2 Implementation of Fuel Efficiency (CO₂) Standards for Light Vehicles

A key measure in many developed countries to address greenhouse gas emissions from motor vehicles has been to adopt a standard to mandate a particular level of fuel efficiency or CO_2 emissions.

Mandatory fuel efficiency or CO₂ emissions standards for light vehicles are in place in approximately 80 per cent of the global light vehicle market – including the US, the EU, Canada, Japan, China and India.²⁶

Unlike standards for noxious emissions, which set requirements at an individual vehicle level, fuel efficiency (CO₂) standards are generally applied on a fleet wide average basis. This allows for the diversity of consumer and business needs in the vehicle market (such as vehicle type, engine size and power, fuel type, and transmission type).

²⁶International Council for Clean Transportation (ICCT) (n.d) *Global passenger vehicle standards*. Accessed at: <theicct.org/info-tools/global-passenger-vehicle-standards> [16 September 2015].

The target set for these standards and the basis on which they are determined differ across countries, reflecting differing priorities, preferences and institutional arrangements globally. For example, the EU standards determine a manufacturer's fleet average target on the mass of the vehicles they sell, whereas standards in the US determine a manufacturer's target on the footprint (length of wheelbase multiplied by track width) of the vehicles sold. These approaches can influence the way manufacturers improve the efficiency of their vehicles, for example making it easier for manufacturers to meet a footprint adjusted standard by making a vehicle lighter than a mass adjusted standard.

The adoption of fuel efficiency (CO_2) standards may have an impact on costs to manufacturers and consumers due to the need for new technologies and design features but these could be offset by fuel savings over the life of the vehicle. Manufacturers may be able to offset these costs to some extent through improved economies of scale, as many of these technologies are widely available in markets with standards.

Previous studies by the then Department of Infrastructure and Transport in 2012 (unpublished) and the Climate Change Authority in 2014 have demonstrated that fuel efficiency (CO_2) standards can yield a net saving to motorists over the vehicle's life.

Based on overseas experiences, it appears there is scope for fuel efficiency standards to make a substantial contribution to national CO_2 emissions targets by a 2030 timeframe, as over three quarters of the vehicles that will comprise the 2030 on-road fleet are yet to be sold.

The adoption of fuel efficiency (CO_2) standards would require an appropriate lead in time to allow manufacturers to respond. Vehicle manufacturers have previously advised they require lead time of up to 60 months to make any substantive changes as product planning is locked in with their parent company three or four years in advance, which may limit the scope for any substantive changes in the short term. Recent research indicates that internationally, lead times of around three years for the introduction of vehicle emissions standards are common.²⁷

4.2.1 Other key factors when considering light vehicle fuel efficiency (CO₂) standards

Consumer preferences

The different fuel efficiency standards in the EU and the US can in part be explained by the fact that consumer preferences of individual markets can have a bearing on the setting of emissions standards within that market. When considering Australia's reduction of CO₂ in the light vehicle fleet it is worth noting that broadly, consumer preferences within the Australian market are currently more closely aligned with the US market than EU markets. Recent research undertaken by the National Transport Commission (NTC) found that Australian consumers had a much stronger preference than their UK counterparts for larger, more powerful vehicles, and for vehicles with automatic transmissions.²⁸

²⁷ Climate Change Authority (2014), Light Vehicle Emissions Standards for Australia – Research Report, p57

²⁸ National Transport Commission (2014) Carbon Dioxide Emissions from New Australian Vehicles 2013. Information paper, May 2014 p43-44

Analysis by the Department of Infrastructure and Regional Development has also found that average fleet CO_2 emissions in the US and Australia are similar overall (but varied with vehicle type), but higher than the average fleet CO_2 emissions of Germany. A range of factors contributed to the variation between Australia and Germany, including:

- the relative market share of passenger, sport utility and light commercial vehicles
- the mix of vehicle/engine size; and
- the mix of automatic and manual transmissions.

In addition, there are a much greater proportion of light passenger vehicles with diesel engines within the EU than in either Australia or the US. Diesel engines are generally more fuel efficient than petrol based engines and can therefore make a greater contribution to a vehicle fleet's overall CO₂ emissions target.

Linkages with Noxious Emissions

The introduction of fuel efficiency (CO₂) standards could therefore see a shift towards a greater market share in Australia for diesel passenger vehicles. However, this may have an adverse impact on urban air quality, as diesel engines generally produce higher levels of noxious emissions than their petrol counterparts. These risks may be mitigated through the adoption of increasingly stringent noxious emission standards. The 'Euro 5' noxious emissions standards, which will be fully implemented in Australia by the end of 2016, will reduce emissions of oxides of nitrogen and particulates from light diesel vehicles by 30 per cent and 80–90 per cent, respectively. These changes will effectively eliminate differences between the most harmful particulate emissions in new petrol and diesel vehicles. If Australia adopted the Euro 6 standards, this could further reduce emissions of oxides of nitrogen from diesel vehicles and fine particle emissions from direct injection petrol vehicles.

Tested vs 'Real World' Emissions

Internationally, standards have been found to be an effective way to improve the efficiency of the light vehicle fleet, although the EU experience also suggests the extent of these improvements would be smaller in practice.²⁹ This is because manufacturers optimise their vehicles to achieve the best possible result in standardised and repeatable test conditions within a laboratory to meet the standards in ways that may not necessarily translate to real world on-road performance, which can be also affected by environmental conditions and driver behaviours.

Further, standards in the EU and the US provide for various allowances or "credits", which enable manufacturers to further reduce their reported average emissions. These credits are intended to encourage investment in technologies that have benefits not captured in a standardised test cycle (such as air conditioning refrigerants with a lower global warming potential) or high cost, high abatement technologies such as electric vehicles.

²⁹ European Commission (2014) Evaluation of Regulation 443/2009 and 510/2011 on the reduction of CO₂ emissions from light-duty vehicles, p38

To address the gap between tested and real world emissions, the EU plans to replace its current test cycle with the new Worldwide Harmonised Light Vehicles Test Procedure . If standards are adopted in Australia, it is proposed that this procedure be used as the basis for determining a light vehicle's CO_2 emissions.

Nevertheless, there is also evidence to suggest a growing gap between tested and on road emissions as overseas standards become more stringent and even the new testing procedure is unlikely to 'bridge the gap' between tested and on road emissions. A potential option is to develop a real world adjustment factor for CO₂ emissions, which is currently used in the US. This would adjust the total to more accurately reflect on road performance for consumers, giving them a better picture of what the actual CO₂ emissions are for the vehicle on road to help make more informed decisions when purchasing a new vehicle. However, as Australia accounts for a much smaller share of the new vehicle market, and this issue is not unique to Australia, it may be more appropriate for an 'adjustment factor' to be considered at an international level through the UN World Forum for the Harmonisation of Vehicle Regulations.

Issues related to vehicle emissions testing are discussed in more detail at Section at 5.2 and 5.7.

Questions:

- 7. What are the costs and benefits of adopting a fleet average standard for fuel efficiency (CO₂)?
- 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?
- 9. How would standards affect the range of vehicles offered in Australia?
- 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?
- 11. What would be the most efficient and effective measures to improve the fuel efficiency of heavy vehicles in Australia?
- 12. Should the Australian Government conduct a review to consider whether fuel efficiency measures for motorcycles should be adopted in Australia?

5. Other complementary measures to reduce emissions

As well as adopting standards, governments can also adopt a range of measures to encourage the supply of more efficient vehicles and vehicle operation.

5.1 Fuel Quality Standards

Vehicle manufacturers consider that a lower sulfur limit for petrol in Australia is necessary to enable a wider range of technologies to be offered and to ensure vehicles meet the durability requirements of the Euro 6 noxious emissions standards. The World Wide Fuel Charter 2013, states that petrol containing a maximum of 10 ppm sulfur is the fuel required for light vehicles to meet the durability requirements of the Euro 6 noxious emissions standards.

However, Australian petroleum refiners question whether 10 ppm sulfur petrol is necessary to ensure the Euro 6 standards achieve their desired outcome. They suggest the costs of producing lower sulfur fuel may affect the viability of refineries in Australia.

In relation to fuel efficiency, a higher RON could make it easier for manufacturers to improve vehicle efficiency through higher compression. It is also possible to improve vehicle efficiency by measures that do not require substantive changes to engine technology, such as light weighting, lower rolling resistance tyres and improved transmissions. It is noted that higher octane premium unleaded petrol typically has a retail price that is marginally higher than regular unleaded petrol, which may inhibit consumer acceptance of technologies requiring higher octane fuels if a cheaper option remains available and the benefits are not clear. As the benefits of premium fuels appear to vary with the engine technology used by each manufacturer, this may require manufacturers to design vehicles requiring these fuels to offset the extra cost through equivalent improvements in efficiency, and for consumers to be made more aware of these benefits.

A review of the *Fuel Quality Standards Act 2000* is currently underway. The review includes an assessment of the operational effectiveness of the Act and whether an Act that enables the setting of fuel standards is still required. It is expected that the report from that review, including findings and recommendations, will be presented to the Australian Government in April 2016.

Subject to the outcome of the review of the *Fuel Quality Standards Act 2000*, the Australian Government may review the fuel quality standards currently in place. The Australian Government considers any review of the fuel quality standards to be an opportunity to harmonise Australian fuel standards with vehicle emission standards and, where possible, international fuel standards.

Questions:

- 13. Are there changes to fuel quality standards that could assist with reducing noxious emissions and/or CO_2 emissions?
- 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?
- 15. To what extent, if any, do current fuel quality standards limit the choices of vehicles/technologies in Australia and why?
- 16. Are there other measures that governments could adopt to encourage the supply and purchase of higher quality fuels?

5.2 Information and Education

Measures that provide information and education on the efficiency and environmental performance of vehicles can help consumers make better informed decisions when considering the purchase of a new vehicle.

Australia's mandatory fuel consumption label requires all new light vehicles to display a label providing information on a vehicle's fuel consumption and CO_2 emissions. Many other countries provide additional information on their fuel efficiency labels, such as an estimate of fuel costs or an efficiency rating, along similar lines to the star rating system currently used for household appliances in Australia. However, as fuel costs and vehicles change over time, fuel cost estimates and rating thresholds would need to be updated regularly to ensure they remain relevant. Local fuel costs may also vary by a range of factors which may cause some consumers to question the relevance of this information.

The Australian Government's Green Vehicle Guide website was updated in 2015 to enable consumers to estimate fuel costs based on different prices for different fuels and individual circumstances. An alternative to including fuel consumption information on the label could be for the fuel consumption label to refer consumers to the Green Vehicle Guide website for a more appropriate estimate of fuel costs.

As a new and more robust test procedure for measuring light vehicle efficiency and emissions is expected to be adopted in EU and UN vehicle regulations in the next few years, the Australian Government will consider the merits of adopting this new test cycle to inform the current fuel consumption labelling standard. To help consumers identify more efficient vehicles, the Australian Government could also undertake a review to consider how the quality of information provided to consumers via the fuel consumption label and the GVG could be improved.

Should a target for light vehicle fuel efficiency (CO₂) emissions be adopted, this review could also consider how the label and the GVG website could support the objectives of these standards.

Information and education measures for in-service vehicles

As the scope of the *Motor Vehicle Standards Act 1989* is limited to the point of supply to the Australian market, the Australian Government is only able to mandate the provision of fuel consumption and CO₂ emissions data for new vehicles. Some countries, such as New Zealand, also require registered motor vehicle traders and private sellers to affix a fuel economy label, and display fuel economy information on trading websites for used vehicles, where data is available. As the Australian Government does not have jurisdiction over second hand car sales, implementing such an approach would likely require the cooperation of state and territory governments. Alternatively, the Australian Government could promote greater awareness of the GVG website which includes information for most vehicles sold in Australia since 2004.

Another option that could be considered is promoting greater awareness of more efficient driving practices (eco-driving). Significant fuel efficiency and cost savings for commercial transport operators and individual motorists can be achieved through changing driver behaviour, collecting and analysing fuel consumption data, planning more efficient routes, better load management, purchasing vehicles appropriate for their use and properly maintaining vehicles. Currently, the GVG website provides advice for motorists on improving their fuel efficiency, and the Emissions Reduction Fund provides incentives for changes to operational practices that increase efficiency. There may be opportunities to promote these practices more widely.

Case studies and eco-driving pilot programmes suggest that energy efficiency improvements of between five and 25 per cent are possible, saving fuel and improving safety. With regard to heavy vehicles, trials of Linfox's internal Eco Drive program using route modelling software have demonstrated energy savings of up to 14 per cent. There may be potential, in collaboration with the states, territories and automobile clubs to develop national principles and effective strategies for the implementation and dissemination of eco-driving advice. This could include promotion of tangible benefits and progressive introduction into driver training.

In relation to heavy vehicles, an option could be to develop a Green Freight initiative similar to the US Environment Protection Agency's (EPA) Smartway program or the Green Freight program in Europe (which is industry led), to improve the fuel efficiency of the transportation supply chain.

Questions:

- 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?
- 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?
- 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?
- 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?
- 21. What could governments do to improve the availability of data on fuel efficiency of used vehicles?
- 22. How could governments encourage more efficient driver behaviour?

5.3 Fleet Purchasing Policy

Fleet purchases represent a large proportion of new vehicle sales and have a significant influence on the second hand vehicle market.

The Australian Government's fleet purchasing policy is currently designed to encourage the purchase of Australian made vehicles. Under the current arrangement Australian Government agencies are required to make a business case for purchasing an imported passenger vehicle, which requires agencies to demonstrate that an Australian made vehicle would not be suitable for operational reasons.³⁰

However, the three current Australian light vehicle manufacturers, Ford, GM Holden and Toyota have all announced that they will close their Australian light vehicle manufacturing operations by the end of 2017.

A future government fleet purchasing policy could be structured to achieve a range of objectives. One option could be to encourage agencies to select smaller, more fuel efficient vehicles (four cylinders or less). Another option could be to explicitly drive improvements in vehicle efficiency through a fleet purchasing policy based on CO_2 emissions. This could be set at an absolute limit, or a fleet average target. An alternative would be to consider a policy that aims to reduce overall CO_2 emissions from vehicle usage, which would encourage more efficient vehicle operation as well as the purchase of more efficient vehicles.

A further option could be to support the purchase of electric and alternative fuel vehicles, which could play a role in addressing some of the barriers to the uptake of these technologies such as availability of recharging and refuelling stations. However, this option would involve a higher upfront cost to government.

As part of the National Energy Productivity Plan the Commonwealth has committed to develop a new Government Energy Productivity policy in 2016. This will consider how the Australian Government could drive improvements in the efficiency of the vehicle fleet, through fleet purchasing policy and build on policies already adopted at the state, territory and local government level.

Question:

23. What role, if any, should the Government fleet purchasing policy play in encouraging the supply and purchase of more efficient vehicles?

³⁰ Australian Government Department of Finance – Fleet Vehicle Selection Policy (as at April 2012).

5.4 Taxation Measures

The tax treatment of motor vehicles and vehicle operation can influence vehicle purchasing decisions and how motorists use their vehicle. Governments could encourage improvements in vehicle efficiency through changes to the tax treatment of vehicles and road user charges.

Luxury Car Tax

To encourage the purchase of efficient vehicles, the Australian Government currently applies a higher threshold (currently \$75,375 (GST inclusive)) for the luxury car tax to vehicles with fuel consumption less than 7L/100km. For other vehicles the luxury car tax of 33 per cent applies to vehicles valued over \$63,184 (GST inclusive). Reform of the luxury car tax will be considered in the context of broader tax reform as part of the Tax White Paper process.

As the threshold for fuel efficient vehicles is purely based on fuel consumption, this arrangement currently favours diesel vehicles, which consume less fuel per km, but produce more CO_2 per litre of fuel consumed and generally produce higher levels of noxious emissions than equivalent petrol vehicles. If the luxury car tax was retained, the Australian Government could consider restructuring the luxury car tax to apply different thresholds based on CO_2 emissions to encourage consumers to purchase more efficient vehicles and lower emissions. Under this arrangement, the highest threshold would apply to vehicles with CO_2 emissions well below the national average and the lowest threshold would apply to vehicles with CO_2 well above the national average.

To ensure these incentives do not have an adverse effect on air quality, the higher thresholds could also require that vehicles meet a minimum air pollution standard or exclude certain vehicles (e.g. diesel vehicles). However, the adoption of the Euro 5 and potentially Euro 6 noxious emission standards will effectively require all new diesel vehicles to be fitted with a particulate filter which effectively address the most harmful particulate emissions from diesel vehicles.

Sustainability of incentives

To ensure incentives are sustainable over a period of time, any changes to the luxury car tax would need to be revenue neutral, with concessions for more efficient vehicles being offset by additional charges for less efficient vehicles. This may require thresholds for concessions to be updated on a regular basis as the fleet improves.

Fuel excise and fuel tax credit

The Australian Government also levies an excise tax for petrol and diesel, which is adjusted by the consumer price index on a six monthly basis. Excise on gaseous fuels (such as LPG and natural gas) is also levied at the rate of 50 per cent of the energy content equivalent rate for petrol. As fuel excise paid by consumers is directly linked to fuel consumption, the effects of fuel excise on retail fuel prices can provide an incentive for motorists to drive less, drive more efficiently and purchase more efficient vehicles. Some stakeholders have previously noted that higher fuel prices have helped encourage the supply and purchase of more efficient vehicles in EU countries.

To remove the incidence of fuel excise from fuels used as a business input, the Australian Government provides a fuel tax credit to eligible businesses. For on-road heavy vehicle operators, this fuel tax credit is equivalent to the fuel excise minus a road user charge levied to recover road construction and maintenance costs attributable to heavy vehicles.

To ensure transport operators maintain heavy vehicles to an acceptable standard, the Australian Government currently specifies environmental criteria that operators must meet in order to claim this fuel tax credit for heavy diesel vehicles. The measures aim to ensure that older heavy diesel vehicles continue to comply with nationally agreed in-service requirements for heavy diesel vehicle emissions.

To discourage the use of older heavy diesel vehicles meeting less stringent standards, some elements of the heavy vehicle sector have previously proposed that the environmental criteria for the fuel tax credit be revised to reduce or remove the eligibility for the fuel tax credit for older vehicles. The revenue saved from such a change could then be used to fund measures to help operators with older fleets to purchase newer vehicles meeting the latest standards. It should be noted that the Australian Government's Emissions Reduction Fund currently provides financial incentives for projects that upgrade older fleets to newer more efficient vehicles.

State and Territory Charges

In addition to the taxes levied on motor vehicles by the Australian Government, state and territory governments levy stamp duty charges on the purchase of motor vehicles and periodic registration charges, which can also influence vehicle purchasing decisions.

In all states and territories, stamp duty charges are based on the value of the motor vehicle. Some state and territory governments also vary the rate of duty according to environmental criteria.

To encourage the purchase of more efficient vehicles, the ACT Government currently levies differential rates of stamp duty for vehicles based on their CO₂ emissions. Under the ACT scheme, new vehicles producing less than 130g/km pay no stamp duty and vehicles that produce between 131 and 175g/km pay a reduced rate. The standard rate applies to vehicles that produce between 176 and 220 g/km, with the highest rate of duty applying to new vehicles that produce more than 220g/km.³¹

The Queensland Government levies different rates of stamp duty based on vehicle engine type, with the lowest rate applying to electric and hybrid vehicles and the highest rates applying to vehicles with seven or more cylinders.³²

³¹ ACT Government (n.d) Building an Integrated Transport Network, Reducing Emissions. Accessed

at:-http://www.rego.act.gov.au/__data/assets/pdf_file/0004/744412/Vehicle-Emission-Reduction-A3-A4-29June.pdf> [6 November 2015]. Queensland Government (2015) About vehicle registration duty. Accessed at: http://www.qld.gov.au/transport/registration/fees/duty/about/ [22 December 2015].

In addition to stamp duty, state and territory government levy registration charges on vehicles. In some jurisdictions, these charges vary on the basis of a vehicle weight or engine. This can encourage the use of lighter and smaller engine vehicles, but can also penalise hybrid vehicles, which may be heavier than equivalent petrol or diesel vehicles. To encourage the purchase of hybrid and electric vehicles, the NSW and Victorian Governments currently offer a reduced registration charge for hybrid and electric vehicles.^{33 34}

Questions:

- 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?
- 25. To ensure incentives do not have any unintended consequences on air quality, should incentives include noxious emissions requirements as well as CO₂ requirements, or do current noxious emissions standards sufficiently mitigate this risk?

5.5 Alternative Fuels and Electric Vehicles

As well as improving the efficiency of conventionally fuelled vehicles and powertrains, vehicle emissions could be reduced by switching from more emissions intensive fuel sources (such as petrol and diesel) to alternatives with lower emissions such as natural gas and biofuels (ethanol and biodiesel) as well as using hybrid and electric vehicles (depending on the upstream energy source).

A number of benefits may flow from the use of alternative fuels, including:

- For households, very low running costs for electric vehicles, convenient home charging, high vehicle performance, and the ability to integrate with home solar systems;
- For transport and energy supply industries, opportunities may exist in supporting new technologies and accessing new markets; and
- For new industry players, including electricity retailers moving into the transport sector.

Gaseous Fuels and Biofuels

Biofuels such as ethanol and biodiesel, and gaseous fuels (such as liquefied natural gas, compressed natural gas and liquefied petroleum gas), already contribute to diversity in the fuel supply. Despite government assistance to producers and importers over the last decade, including mandates, alternative transport fuels have struggled to gain a foothold in the domestic liquid fuel market.

³³ Roads and Maritime Service NSW (2016) Registration costs and concessions, Accessed at:

<http://www.rms.nsw.gov.au/roads/registration/fees/index.html> [29 January 2016].
³⁴ Vicroads (2014) Hybrid vehicle registration discount. Accessed at: http://www.vicroads.vic.gov.au/registration/registration-fees/concessions-and- discounts/hybrid-vehicle-registration-discount> [22 December 2015].

A critical precursor to turning this situation around is increased consumer acceptance of alternative fuels and production of cost competitive alternative fuels without ongoing assistance. Consistent with approaches elsewhere in the energy sector, the Australian Government has traditionally preferred to not intervene in a way that promotes one technology over another or forces technologies that are not cost competitive into the market at a net cost to consumers or taxpayers.

Electric Vehicles

Electric vehicles are currently a very small part of the Australian market, with 1,120 vehicles sold in 2014 and 1,314 in the year to October 2015.³⁵ Future projections vary for the growth of electric vehicle sales in Australia. A recent report by Energeia for the Energy Supply Association of Australia (ESAA) suggested that, without assistance, cumulative electric vehicle sales could reach 3.4 million vehicles, or 18 per cent of the Australian vehicle fleet, by 2035.³⁶ The Australian Energy Market Operator (AEMO) examined the impact of electric vehicles on electricity demand, and projected cumulative sales of 0.5 million electric vehicles over the same period.³⁷

The main economic factor in the adoption of electric vehicles is the significant cost premium for these vehicles compared to their fossil fuel equivalents. The current premium relates to the cost of the vehicle batteries. However, demand for batteries, rapid increases in production (economies of scale) and competition amongst battery providers is already leading to lower battery and vehicle costs.

Energeia considered policy options to encourage uptake of electric vehicles, and found that policies that seek to lower the cost of vehicles, such as subsidies or lower registration fees, resulted in a net economic cost. The cost of the subsidy outweighed benefits such as economic and employment growth and air quality improvements. Low cost policies such as allowing use of transit lanes and requiring manufacturers to increase model availability resulted in net economic benefits.

Recharging infrastructure may be another limiting factor, but these facilities are starting to emerge. Western Australia has developed an electric vehicle highway from Perth to Augusta. The US based car manufacturer Tesla Motors is also starting to develop charging infrastructure - it has opened its 'Supercharger' (fast charge) charging stations in Wodonga and Goulburn to allow Tesla owners to drive from Melbourne to Sydney. Tesla has also partnered with Secure Parking to provide charging stations in 18 parking garages across Melbourne, Brisbane and Sydney. Appropriate price signals for recharging electric vehicles will be required to incentivise people to charge vehicles in off peak times. If not, electric vehicles could exacerbate peak demand issues, requiring expensive investment in electricity infrastructure which will drive up electricity prices.

³⁵ Energy Supply Association of Australia (ESAA) (2015) *esaa Technology Report*. Accessed at: <http://www.esaa.com.au/preview/0ac3aeb9-c5f4-45d9-8a0c-ba3fb7151e29>

³⁶ Energeia (2015) Review of Alternative Fuel Vehicle Policy Targets and Settings for Australia. Accessed at: http://www.esaa.com.au/Library/PageContentFiles/69ae0935-d7e1-4dfe-9d3d-

⁰³⁰⁹a1ff8e62/Energeia%20Report%20for%20esaa%20_%20Optimal%20AFV%20Policy%20Targets%20and%20Settings%20for%20Australia.pdf> ³⁷ Australian Energy Market Operator (AEMO) (n.d) *NEFR Supplementary Information 2015*. Accessed at:

<htp://www.aemo.com.au/Electricity/Planning/Forecasting/National-Electricity-Forecasting-Report/NEFR-Supplementary-Information>

The emissions impacts of electric vehicles also depends on the fuels used to generate electricity. In Australia, greenhouse gas and other emissions from electric vehicles are comparable to fossil fuel vehicles, as most electricity generation is sourced from fossil fuels.³⁸ The emissions intensity of electricity generation in Australia is expected to reduce over time, however, driven in part by policies such as the Renewable Energy Target, as well as improvements in the cost competitiveness of renewable energy technologies.

Hydrogen Fuel Cells

Major global automobile manufacturers are investing in research and development of hydrogen fuel cell vehicles. However, many of the same issues apply, including the cost premium of these vehicles and the emissions intensity of hydrogen production.

Financing alternative fuelling infrastructure

Private finance can help address some of the most significant impediments to alternative fuel vehicle infrastructure investment. Innovative financial tools can help overcome barriers similarly faced by other clean energy technologies, such as renewable energy or energy efficiency upgrades. The Clean Energy Finance Corporation (CEFC) invests commercially to fund a range of projects including low emissions technologies. One scheme aims to deliver lower emission vehicles by offering finance to low emission and electric vehicles. More on the CEFC can be found at Appendix 1.

Some financial models that have been helpful in advancing cleaner technologies may also be useful in mobilising stronger investment in alternative fuel vehicle infrastructure. These include leasing, performance contracting and green banks. Although not a complete answer for alternative fuel vehicles, private investment can assist in breaking down some of the barriers facing new technologies. These financial models can also engage a broader group of investors, secure longer loan terms, and ultimately reduce the costs of capital. These conditions would allow more potential buyers to enter the alternative fuel vehicle market and help infrastructure providers survive until demand for their product has increased to a viable level. 39

The Australian Government does not currently have specific policy objectives for electric and hydrogen vehicles. New policies would need to take into account the emissions intensity of hydrogen production and Australian electricity generation. Other factors, such as improved fuel security and improved utilisation of electricity generation and network assets, could contribute to building a case for supporting electric and hydrogen vehicles.

³⁸ Energeia (2015) Review of Alternative Fuel Vehicle Policy Targets and Settings for Australia. p.20. Accessed at:

http://www.esaa.com.au/Library/PageContentFiles/69ae0935-d7e1-4dfe-9d3d-

⁰³⁰⁹a1ff8e62/Energeia%20Report%20for%20esaa%20_%20Optimal%20AFV%20Policy%20Targets%20and%20Settings%20for%20Australia.pdf>, US Department of Energy (2014) Alternative Fuel Vehicle & Fueling Infrastructure Deployment Barriers & the Potential Role of Private Sector Financial Solutions, April 2014.

Questions:

- 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?
- 27. What measures could be adopted to encourage the supply of alternative fuelled vehicles and supporting infrastructure, to reduce emissions from road transport?
- 28. How might fuel standards need to be adapted to accommodate alternative fuels?

5.6 Intelligent Transport Systems

The Australian Government is also exploring opportunities to achieve reductions in vehicle emissions as one of the benefits of the development, adoption and deployment of Intelligent Transport Systems (ITS). ITS generally refers to the use of information and communications technology for transport to achieve safety, mobility and environmental outcomes. ITS includes a suite of current and emerging stand-alone technologies such as traffic management systems and connected and automated vehicles.

Australia is actively embracing ITS applications and technologies and in some instances is a world leader in their deployment, such as for example through smart motorways, and free-flow electronic tolling. Effectively deployed ITS can enhance movement of commuters and freight through existing transport infrastructure, reduce congestion, lessen travel times and inform future planning for our transport networks. This could not only assist in reducing emissions but also bring significant productivity and safety benefits.

Effective ITS projects can generate large benefits for small costs when compared to 'traditional' infrastructure investment. For example, coordinated ramp metering at Melbourne's Monash freeway increased peak throughput by 30 per cent, saved 16,500 litres of petrol and led to a 40 tonne daily reduction in greenhouse gas emissions. All at a relatively low cost – with the \$1 million pilot program having an economic payback period of just twelve days.⁴⁰

The Australian Government is leading the development of a new National Policy Framework for ITS in Australia, in partnership with states and territory governments. The new policy framework is expected to be finalised by May 2016.

⁴⁰ Bureau of Transport, Infrastructure and Regional Economics (BITRE) (2015) Information Sheet 55: Infrastructure, Transport and Productivity.

5.7 Vehicle Emission Testing

Current Arrangements

To determine whether a vehicle complies with relevant emission standards, vehicles are tested by the manufacturer in accordance with an international standard adopted in the Australian Design Rules (ADRs). Light vehicles are tested by the manufacturer in a vehicle laboratory in conditions specified in the ADRs.

For heavy vehicles, noxious emission standards are based on an engine's power output rather than an engine installed in a vehicle. For this reason heavy vehicle engines are tested as a standalone unit rather than part of a whole vehicle. This recognises that heavy duty engines can be used in a wide range of vehicle configurations beyond the control of the original equipment manufacturer.

To ensure vehicles are tested in accordance with the ADRs, manufacturer tests and test facilities are audited by the Department of Infrastructure and Regional Development on a risk assessed basis.

A standardised approach to vehicle emissions testing ensures test results are repeatable and vehicles can be assessed on a common basis. However, it is widely recognised that a number of variables can also affect vehicle emission levels in an on-road setting such as traffic conditions, vehicle condition (e.g. service history and tyre pressure), driver behaviour (e.g. harsh acceleration and braking), fuel quality, vehicle usage (e.g. loading, towing and air conditioner use) and environmental conditions (e.g. ambient temperature). As a result, the emissions levels in 'real world' conditions may differ from those reported in a standardised test.

Due to the wide range of variables that affect fuel consumption and emissions, the current standards adopted in Australian and international vehicle regulations do not require manufacturers to demonstrate their vehicles meet the emission limits in an on-road setting.

Defeat devices and implications for emission testing arrangements

On 18 September 2015, the US Environmental Protection Agency issued a Notice of Violation to the Volkswagen Group alleging the use of defeat devices in a range of vehicles powered by its diesel EA 189 engines. The Volkswagen Group is now being investigated in a number of countries in relation to the alleged use of these 'defeat devices'. Speculative questions have been raised as to whether the use of defeat devices could in part explain growing differences in tested and onroad emissions.

Defeat devices provide a means whereby vehicles operate differently in an emissions test to produce a better result than they would in normal vehicle operation. These devices are specifically prohibited under Australian and international vehicle regulations.

In light of these allegations, some stakeholders have suggested the Australian Government should conduct, require or fund independent on-road testing to ensure the public can have confidence in the claims made by vehicle manufacturers. However, use of these devices if proven would be considered fraudulent activity and dealt with under existing arrangements.

With respect to the requirements of the current standards, there is still a question as to whether regulated limits in a laboratory test can represent what is actually achieved in on-road conditions and whether on-road testing in Australia could contribute to the development of an improved international standard.

The Australian Government is engaging with international regulators through the UN World Forum for the Harmonisation of Vehicle Regulations to explore options for an international standard for on-road testing based on the Real Driving Emissions (RDE) test recently agreed in the EU. An international on-road test would complement planned changes to laboratory testing such as the new Worldwide Harmonized Light Vehicles Test Procedure, which is expected to be adopted in EU and UN vehicle regulations by the end of 2017. The RDE test would help ensure vehicle designs optimised for laboratory testing would also achieve an appropriate level of performance on-road and would also improve detection of defeat devices.

How testing could be used to assess the environmental performance of the vehicle fleet and the effectiveness of existing standards

As mentioned above, it is widely recognised that emissions levels in real world conditions are likely to be higher than those reported in certification test conditions, due to the wide range of variables that can affect emissions controlled in a certification test. However, differences between tested and real world emissions do not necessarily mean that standards currently in place are not effective in reducing emissions.

The Australian Government has previously undertaken a number of studies to consider vehicles performance in-service and the extent to which standards have reduced emissions.

The National In-Service Emission Study (NISE1), published in 1996, is the most comprehensive study of emissions from cars ever undertaken in Australia. It tested over 600 vehicles manufactured between 1980 and 1993 and demonstrated that considerable exhaust emissions benefits could be obtained from regular tuning and maintenance. An update and expansion of this study, NISE 2, covering later model vehicles, was completed in March 2009.

The NISE 1 study also indicated that evaporative emissions from vehicles were, on average, well above the limits mandated in the then applicable standard, Australian Design Rule 37(ADR37). A subsequent Petrol Volatility Project (1997) examined this in more detail and concluded that reducing the volatility of commercial petrol was the most cost effective means to address this problem. States have since set limits on the volatility of summertime petrol supplies.

The NISE 2 study provided valuable information to demonstrate the effectiveness of more stringent standards and helped inform the Australian Government's previous decision to adopt the Euro 5 emissions standards for light vehicles.

To evaluate the effectiveness of the latest standards and inform implementation of new standards, the Australian Government could consider conducting another study of the in-service emission performance of the vehicle fleet, using the latest emissions testing methods in accordance with internationally accepted standards.

Data from the NISE studies also underpins Australia's national greenhouse gas accounts, and the reporting of emissions from the transport sector under international reporting rules. Up to date data on the real world performance of Australia's vehicle fleet will support the ongoing ability to accurately account for emissions reductions and show contributions to Australia's emission reduction targets from policy measures to reduce greenhouse gas emissions from the transport sector.

Questions:

- 29. Should the Australian Government conduct a testing program to assess the effectiveness of UN Regulations in reducing real-world emissions?
- 30. How should the costs of a testing programme be met?
- 31. How could UN Regulations for vehicle emissions testing be improved?

Appendix 1 - Other Relevant Australian Government Measures

Emissions Reduction Fund (ERF)

The ERF is the Australian Government's central policy to reduce emissions. It is designed to source low-cost emissions reductions by providing incentives for eligible emissions reduction projects across the economy. The Government has provided \$2.55 billion to establish the ERF.

Through the ERF, Australian businesses, communities and landholders can propose new projects to reduce or avoid greenhouse gas emissions. Project proponents can receive funding from the ERF by submitting their projects into a competitive auction run by the Clean Energy Regulator. This provides incentives to adopt smarter practices and technologies to reduce emissions, including for activities like improving energy efficiency, capturing methane from landfills and storing carbon in forests and soils.

The ERF is already providing the impetus for businesses and the community to improve practices, invest in new technologies, and reduce our emissions. In the two successful ERF auctions so far the Government has contracted to purchase over 92 million tonnes of emission reductions from 275 projects at an average price of \$13.12 per tonne of abatement. The full results of both auctions are available at: www.cleanenergyregulator.gov.au.

ERF projects must be undertaken in accordance with approved methods. The ERF Land and Sea Transport method supports a broad range of activities that reduce emissions from road transport including modifying or replacing vehicles, fuel switching and changing how vehicles are operated. A number of transport abatement projects have been registered under this method.

Emissions Reduction Fund Safeguard Mechanism

The safeguard mechanism will ensure that emissions reductions paid for through the ERF are not offset by significant increases in emissions elsewhere in the economy.

The safeguard will apply to around 140 large businesses that have facilities with direct emissions of more than 100,000 tonnes of carbon dioxide equivalence (t CO_2 -e) a year. This will cover around half of Australia's emissions. The safeguard mechanism could apply to approximately 10 per cent of transport sector emissions and will commence on 1 July 2016.

Clean Energy Finance Corporation

The Clean Energy Finance Corporation (CEFC) is an Australian Government owned organisation that mobilises capital investment in renewable energy, low emissions technology and energy efficiency. One of the CEFC's focus areas is lowering emissions in the transport sector by increasing the uptake of fuel-efficient and low emission vehicles. The CEFC currently supports three programs to promote an increase in the uptake of low emissions vehicles in Australia:

- A \$50 million funding package with Eclipx Group, one of Australia's largest independent fleet leasing companies, to provide Eclipx's corporate, government and not-for-profit fleet buyers

with access to favourable loan interest rates when choosing eligible low emissions passenger and light commercial vehicles.

- A \$120 million program with National Australia Bank to provide an incentive for Australian businesses, particularly those in rural and regional Australia, to invest in new plant and equipment to cut their energy and operating costs. The program is designed to help accelerate the switch to 'greener' vehicles, as well as help businesses upgrade to high performance industrial and agricultural equipment and increase their uptake of solar.
- A \$50 million asset financing commitment with Firstmac, a leading non-bank lender in the home loan sector, to deliver low emissions cars and lower power bills for Australian residential and business consumers.

Global Agreement on Climate Change

The Paris Agreement on climate change, to take effect from 2020, was finalised on 12 December 2015 at the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21).

The agreement aims to hold the increase in global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the increase to 1.5 °C. The agreement commits all countries to make successive emissions reduction commitments every five years. Parties to the agreement also aimed to reach a global peaking of greenhouse gas emissions as soon as possible, and to achieve a balance between anthropogenic emissions and the removal of carbon from the atmosphere in the second half of this century (net zero emissions).

Ahead of COP21, Australia and other countries submitted their intended post-2020 targets, known as intended nationally determined contributions. Australia's target is to reduce emissions to 26-28 per cent below 2005 levels by 2030.

In 2018, parties to the Paris Agreement will take stock of collective efforts in relation to progress towards the long term temperature goal under the agreement and to inform subsequent nationally determined contributions.

To meet Australia's abatement targets, the Government has implemented a number of emissions reduction measures including the ERF and its safeguard mechanism. The Australian Government has also committed to a review process in 2017 and 2018 to determine the detailed design of policies that will be used to achieve Australia's 2030 target.

National Energy Productivity Plan

In December 2015, the COAG Energy Council launched a new National Energy Productivity Plan (NEPP) to meet a commitment to an energy productivity target of 40 per cent improvement between 2015 and 2030. The NEPP is expected to contribute more than a quarter of the savings required to meet Australia's 2030 greenhouse gas emissions reduction target. The NEPP will complement existing policies such as the ERF and will aim to avoid placing additional burdens on business.

The NEPP covers all energy use, including electricity, gas and transport fuels, and incorporates:

- energy market reforms to promote consumer choice and increase competition and innovation in the energy market; and
- energy efficiency measures that support better energy use in buildings, equipment and vehicles.

The NEPP will include both existing and new initiatives that support:

- more productive consumer choices when selecting energy services through, for example, costreflective prices, smart meters and access to information, and labels; and
- more productive energy services through innovation and competition, such as reducing barriers to entry in the market for new technologies and service options, and through more efficient minimum standards for equipment, appliances and buildings.

In order to meet Australia's proposed 40 per cent by 2030 energy productivity target; Australia must increase its annual productivity improvement from 1.5 to 2.3 per cent per annum. This target has been designed to be large enough to promote real change while still being achievable.

As shown below, light vehicle emissions have the potential to make a significant contribution to Australia's national energy productivity target.

Figure 8: Sectoral Contribution to Energy Productivity

Illustrative examples



The NEPP notes the Ministerial Forum is exploring options to improve the efficiency of vehicles. The Commonwealth, will collaborate with the states and territories to progress a range of measures to improve productivity, reduce fuel costs and emissions.

G20 – International Transport Collaboration

In November 2014, in Brisbane, G20 leaders agreed the G20 Energy Efficiency Action Plan. The Action Plan lists six work streams for ongoing collaboration and knowledge sharing among G20 members to improve energy efficiency. Transport energy efficiency is one of these work streams. G20 Leaders and Energy Ministers recognised the progress made through the Action Plan's work streams in 2015 and the work streams, including transport energy efficiency, are set to continue in 2016 under China's G20 presidency.

The G20 tasked the International Partnership for Energy Efficiency Cooperation (IPEEC) with progressing and reporting back on the implementation of the Action Plan. IPEEC has set up a transport energy efficiency task group to progress the transport work stream. Members of this task group include: Australia, the US, Brazil, Canada, China, the EU, Germany, Italy, Japan, Mexico, Russia, South Africa and the UK. This task group is supported by the International Council on Clean Transportation (ICCT) as the lead implementing organisation and the Global Fuel Economy Initiative (GFEI).

The Transport Task Group was established by the G20 in order to:

- build domestic support and enhance capability for action to reduce the energy impact of motor transport, especially Heavy-Duty Vehicles (HDV);
- identify and exchange best practices among G20 countries on the implementation of costeffective energy efficiency measures in the transport sector; and
- conduct analysis and outreach to assess the opportunities, barriers, costs and benefits of HDV energy efficiency action, and subsequently recommend a course of action for participating G20 countries.

The transport task group's outcomes in 2015 include:

- publishing a foundational briefing paper (Policies To Reduce Fuel Consumption, Air Pollution, And Carbon Emissions From Vehicles In G20 Nations) which presents opportunities for policy action on clean fuels and vehicles in participating countries;
- exchanging best practices on relevant national standards in participating nations; and
- conducting outreach in participating countries to enhance capacity, generate support and engage the private sector.

The transport task group has established additional goals and follow-up activities for 2016 and beyond. These may include:

- conducting a survey on institutional needs and technical challenges associated with developing options for policy roadmaps in interested countries;
- hosting a series of policy exchanges (including webinars and direct outreach) and information campaigns to share information on latest developments and lessons learnt; and
- supporting the production and release of policy roadmaps by participating countries.

National Clean Air Agreement

In 2015, Australia's Environment Ministers endorsed the National Clean Air Agreement (Agreement) to ensure that the community continues to enjoy clean air and address the impacts on human health and the environment.

The Agreement will focus on actions to reduce air pollution and improve air quality through cooperative action between industry and government at the national, state and local level. The Agreement is designed to incorporate a range of existing, new and complementary measures to improve Australia's air quality.

The Agreement's initial work plan will see the implementation of key decisions taken by Ministers at their meeting. These include strengthening the national ambient air quality reporting standards for particulate matter (both $PM_{2.5}$ and PM_{10}), the introduction of new emission standards for non-road spark ignition engines such as garden equipment and marine outboard motors, and the adoption of new emission and efficiency standards for new wood heaters and sharing best management practices across jurisdictions.

Over the next year, jurisdictions will also work cooperatively to establish and implement the Agreement's priority setting process to help focus efforts where they are most needed. A range of actions will look to address reviewing air quality monitoring and reporting standards for nitrogen dioxide, sulfur dioxide and ozone; targeted measures to reduce emissions from key sources of air pollution; improving access to air quality information for communities; and fostering partnerships with industry.

Motor Vehicle Standards Act Reform

The *Motor Vehicle Standards Act 1989* (MVSA) delivers national vehicle standards for new motor vehicles and regulates the first supply of imported vehicles to the Australian market.

On 10 February 2016, the Australian Government announced its proposed reforms to the *Motor Vehicle Standards Act 1989.* A key focus of the reforms is to reduce regulatory burden and barriers, which would include any regulatory barriers limiting the uptake of energy efficient or alternative energy technologies.

A RIS providing an assessment of the key options proposed for the reform of the Act is being developed and will be publicly released with the draft legislation later this year.

Further detail on the reforms is available at www.infrastructure.gov.au/vehicles/mv_standards_act

Appendix 2 – Ministerial Forum Terms of Reference

The Minister for Major Projects, Territories and Local Government, the Minister for the Environment and the Minister for Resources, Energy and Northern Australia, will constitute a Ministerial Forum, chaired by the Minister for Major Projects and supported by an interdepartmental working group led by the Department of Infrastructure and Regional Development, to coordinate a whole-of-Australian-government approach to addressing vehicle emissions, including testing and reporting arrangements.

The working group will consult broadly with industry stakeholders and coordinate work already underway through different government agencies to examine a range of issues including:

- implementation of Euro 6 or equivalent standards for new vehicles;
- fuel efficiency (CO₂) 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 available through the Clean Energy Finance Corporation and Australian Renewable Energy Agency; and
- National Energy Productivity Plan.

The working group will report by 30 June 2016 to the Ministerial Forum on measures including options for managing fuel quality standards, options for new measurement reporting standards for air pollutants under the National Clean Air Agreement and other measures.

The working group will report by 31 March 2017 to the Ministerial Forum on a draft implementation plan for new measures—aligning with the Government's commitment to announce new measures to deliver Australia's 2030 climate change targets.

Appendix 3 – List of Abbreviated Forms and Glossary

American Council for an Energy-Efficient Economy ACEEE AEMO The Australian Energy Market Operator ADR Australian Design Rule CEFC **Clean Energy Finance Corporation** COAG Council of Australian Governments COP21 United Nations Framework Convention on Climate Change **EPA Environment Protection Authority** ERF **Emissions Reduction Fund ESAA** Electricity Supply Association of Australia EU European Union GFEI **Global Fuel Economy Initiative** GVG Green Vehicle Guide HDV Heavy-Duty Vehicles HFC Hydrofluorocarbons **IPEEC** International Partnership for Energy Efficiency Cooperation ICCT International Council on Clean Transportation LPG Liquefied Petroleum Gas Motor Vehicle Standards Act 1989 **MVSA** NEDC New European Driving Cycle NEPP National Energy Productivity Plan NISE1 National In-Service Emission Study

List of abbreviated forms

| NTC | National Transport Commission |
|------|--|
| OECD | The Organisation for Economic Co-operation and Development |
| PBS | Performance Based Standards |
| ррт | parts per million |
| RDE | Real Driving Emissions |
| RIS | Regulation Impact Statement |
| RON | Research Octane Number |
| UN | United Nations |
| US | United States |
| WLTP | Worldwide Harmonised Light Vehicles Test Procedure |

Glossary

| Airshed | An airshed is a body of air, bounded by meteorology and topography, in which substance emissions are contained. |
|--------------------------|---|
| Biofuel | A fuel that is produced through contemporary biological processes, such as agriculture and anaerobic digestion, rather than a fuel produced by geological processes such as those involved in the formation of fossil fuels, such as petroleum, from prehistoric biological matter. |
| Dynamometer | A device for measuring force, torque, or power of an engine or motor. |
| 'Euro' Standards | European emission standards that define the acceptable limits for noxious exhaust emissions of new vehicles sold in EU member states. |
| | Standards for light vehicles use standard numerals (e.g. Euro 5). |
| | Standards for heavy vehicles use roman numerals (e.g. Euro V). |
| Greenhouse Gas Emissions | Emissions that trap excess heat from the sun, causing a greenhouse effect and climate change. Includes carbon dioxide (CO ₂). |
| Gross Vehicle Mass (GVM) | The maximum laden mass of a motor vehicle specified by the manufacturer. |
| Heavy Vehicle | Passenger or goods carrying vehicles with a gross vehicle mass over 3.5 tonnes. |
| | These include the largest vans and utes/pickup trucks, as well as rigid trucks, buses and prime movers used in articulated vehicle combinations. |

| Light Commercial Vehicle | Vehicles designed primarily for the carriage of goods, with a gross vehicle mass up to 3.5 tonnes. |
|--|--|
| | These include vans and utes/light trucks. |
| Light Vehicle | Passenger or goods carrying vehicles with a gross vehicle mass up to 3.5 tonnes. |
| | These include cars, sports utility vehicles, people movers, small buses, and light commercial vehicles such as vans and utes/light trucks, but do not include motorcycles. |
| Noxious Emissions | Emissions that can cause smog and adverse health impacts. |
| | These include carbon monoxide, hydrocarbons, oxides of nitrogen and particulate matter. |
| Passenger Vehicle | Vehicle designed primarily for the carriage of passengers. |
| | These include cars, sports utility vehicles and people movers. |
| Ramp Meter | A device, usually a basic traffic light or a two- section signal (red and green only, no yellow) light together with a signal controller that regulates the flow of traffic entering freeways according to current traffic conditions designed to control congestion. |
| Research Octane Number (RON) | Standard measure of the performance of an engine fuel. The higher the octane number, the more compression the fuel can withstand before detonating (igniting). |
| Worldwide Harmonised Light Vehicles Test Procedure (WLTP) | A global harmonised standard for determining the levels of pollutants and CO ₂ emissions, fuel or energy consumption, and electric range from light-duty vehicles (passenger cars and light commercial vans). |

Appendix 4 – Summary of questions

Options to reduce vehicle emissions

Adopt Euro 6/VI noxious emission standards for light and heavy vehicles

- 1. What are the likely costs and benefits of adopting Euro 6 emissions standards for light vehicles and/or Euro VI emission standards for heavy vehicles?
- 2. If Euro 6/VI standards were adopted, when would be an appropriate start date and why?
- 3. To what extent do current Australian fuel quality standards limit the adoption/import of existing technologies and models that meet Euro 6 specifications?
- 4. Are there other ways governments could encourage the purchase and supply of vehicles that meet Euro 6/VI emissions standards?
- 5. What measures could governments adopt to ensure vehicles continue to comply with noxious emission requirements beyond the point of supply to the market?
- 6. Should the Australian Government conduct a review to consider whether noxious emissions standards for motorcycles should be adopted in Australia?

Develop Fuel Efficiency (CO₂) Standards

- 7. What are the costs and benefits of adopting a fleet average standard for fuel efficiency (CO₂)?
- 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?
- 9. How would standards affect the range of vehicles offered in Australia?
- 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?
- 11. What would be the most efficient and effective measures to improve the fuel efficiency of heavy vehicles in Australia?
- 12. Should the Australian Government conduct a review to consider whether fuel efficiency measures for motorcycles should be adopted in Australia?

Other complementary measures

Fuel Quality Standards

- 13. Are there changes to fuel quality standards that could assist with reducing noxious emissions and/or CO₂ emissions?
- 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?
- 15. To what extent, if any, do current fuel quality standards limit the choices of vehicles/technologies in Australia and why?
- 16. Are there other measures that governments could adopt to encourage the supply and purchase of higher quality fuels?

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?
- 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?
- 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?
- 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?
- 21. What could governments do to improve the availability of data on fuel efficiency of used vehicles?
- 22. How could governments encourage more efficient driver behaviour?

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?

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?
- 25. To ensure incentives do not have any unintended consequences on air quality, should incentives include noxious emissions requirements as well as CO₂ requirements, or do current noxious emissions standards sufficiently mitigate this risk?

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?
- 27. What measures could be adopted to encourage the supply of alternative fuelled vehicles and supporting infrastructure, to reduce emissions from road transport?
- 28. How might fuel standards need to be adapted to accommodate alternative fuels?

Vehicle Emissions Testing

- 29. Should the Australian Government conduct a testing program to assess the effectiveness of UN Regulations in reducing real-world emissions?
- 30. How should the costs of a testing programme be met?
- 31. How could UN Regulations for vehicle emissions testing be improved?

Please send your submissions to the following address: Vehicle Emissions Working Group The Department of Infrastructure and Regional Development GPO Box 594, CANBERRA ACT 2601 Or via email at: <u>vemissions@infrastructure.gov.au</u> Submissions close on <u>8 April 2016</u>.

