Vehicle fuel efficiency standards

Matthew L James
Science, Technology, Environment and Resources Section

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Introduction

Fuel efficiency pertains to the conversion of chemical fuel energy into vehicle movement, whereas fuel economy is the energy efficiency of a particular vehicle. Larger vehicles, for example, typically have lower fuel economy than smaller vehicles, although their efficiency may be higher. While vehicles have tended to become more fuel-efficient over time, with improved vehicle specifications, the growth in sales of larger types has resulted in little change to overall fleet fuel economy. Fuel consumption in litres per 100 kilometres (km) is actually the reciprocal ratio of fuel economy in kilometres per litre, a semantic difference perhaps, but a subtlety that belies the complexity of the standards used. Fuel efficiency, whether measured per km or per litre, can be divided into engine and total vehicle efficiency, also links to Greenhouse Gas (GHG) emissions (divided into carbon dioxide (CO₂) and non-CO₂ GHGs).

This paper provides an overview of mandatory vehicle CO₂ emission (mandatory fuel efficiency) standards adopted overseas and the standards adopted by Australia. Fuel efficiency links also to air quality emissions (which this paper is not discussing) and issues of fuel quality supply and other combustion emission standards such as those for toxic gases and air particulates are not considered. The paper concerns itself with an emphasis on reducing fuel consumption and CO₂ emissions, not on improving general air quality by reducing emissions of oxides of nitrogen and sulphur (NOₓ, SOₓ), unburned hydrocarbons (HC), and carbon monoxide (CO). The paper does not cover the possible effects of and trends for these pollutant chemicals.

In considering the fuel efficiency standards which are evolving in Australia, the paper discusses a range of questions, some of which have an automotive industry focus—concentrating on passenger car, rather than light truck or heavy vehicle, limits. The central question to be answered is what standards Australia should adopt. Some of the difficulties to be overcome may be summed up as:

The process of developing new fuel economy standards is inherently more complex than can be done justice in a short paper. The timing of standards ... is clearly a crucial element of any new standard—redesigning vehicles is a time-intensive and very expensive process that requires large engineering teams. Redesigning the large part of the new vehicle fleet will require at least a decade, and automakers must proceed cautiously in introducing new technologies to avoid maintenance and operational disasters.

Another issue ... is the economic impact of new standards. In the past, economic analyses of proposed standards have tended to follow a common script—the industry and its consultants forecast huge negative impacts, the environmental community forecasts large positive impacts. In all cases, the results flow primarily from the input assumptions, not robust analysis—the automakers tend to assume that consumers will resist purchasing new models or that they will have to shift to less profitable market segments, while the environmental
community assumes that sales will remain robust and the greater vehicle content will generate
new jobs.¹

After extensive analysis and industry consultation, any new vehicle efficiency standards might be
prescribed under the existing arrangements for Australian Design Rules (see later in this paper).
However, any such decisions would have to consider the initiatives undertaken by global vehicle
manufacturers along with any international movements towards tightening emission standards.

This paper begins by looking at the global push for fuel efficiency standards before turning to
comparing existing standards around the world and then examining Australian policy initiatives.

Global Fuel Economy Initiative (GFEI)

A major global push, the GFEI, or ‘50by50’ initiative, was launched in 2009 as a partnership between
the United Nations Environment Programme (UNEP), the International Energy Agency (IEA), the
International Transport Forum (ITF) and the FIA Foundation. The GFEI:

exists to promote debate and discussion around the issue of fuel economy. On the basis of
current evidence on existing technologies, we believe that huge gains could be made in the
fuel economy, gains which could help every country, but particularly those in the developing
world, to address the pressing issues of climate change, energy security and sustainable
mobility which they face. In the longer term we want to see real improvements in the fuel
economy capacity of the global car fleet. To that end, we will continue to raise awareness,
present evidence, and offer support, in a way which enables more and more countries to
adopt effective fuel economy standards and policies which work in their circumstances and
with their fleet.²

In addition, despite some variations across regions, the GFEI:

... set a target of improving the average fuel economy (in litre/100km terms) for the global
light duty vehicle fleet by at least 50% by 2050 (50by50)...the 2005 average global new vehicle
fuel economy level of about 8 L/100km can probably be reduced to close to 4 L/100km.³

In January 2011, the GFEI released 50by50—Prospects and Progress report (the Prospects and
Progress report) which aims:

... to assess the prospects for reaching the 50by50 goal in the light of on-going research and
other developments that have occurred over the past year or so, and second, to assess the
progress being made in reaching that goal.⁴

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4.  Ibid., p. 2.
The Prospects and Progress report consists of several sections looking at different aspects of moves towards that goal. In section 1, the Prospects and Progress report summarises:

recent trends in new [Light Duty Vehicle] (LDV) fuel consumption across a range of countries and describe[s] a study conducted under GFEI sponsorship to improve understanding of the factors explaining the wide cross-country differences in fuel consumption performance that are presently observed.\(^5\)

Section 2 of the Prospects and Progress report deals with ‘recent studies of the technical potential to improve new LDV fuel economy in the US, Europe, China and India’.\(^6\) Section 3 notes that technical potential does not necessarily translate into improved fuel economy:

... the fuel economy of new US LDVs became worse, even though technologies with the potential to improve fuel economy were constantly being introduced into the fleet. Instead, this technical potential was used to enable increased vehicle size and weight and improved vehicle performance, such as acceleration. In Europe, the translation of technical potential into improved fuel economy performance was better – between 22% and 83% of the technical potential to improve fuel economy actually resulted in improved fuel economy, with the percentage depending on the country and whether the vehicle was powered by gasoline or diesel.\(^7\)

Section 4 of the Prospects and Progress report describes ‘major policy initiatives by the EU and the US federal government that have been finalized to improve car fuel economy as well as initiatives being taken by governments of selected other countries’.\(^8\) One objective of the GFEI is to ‘build capacity in less-developed countries to understand trends in fuel economy and CO₂ emissions and to establish policies, such as standards, regarding them’.\(^9\) Further to this, the Prospects and Progress report discusses a study by the GFEI and the Clean Air Initiative for Asian Cities (CAI-Asia) to encourage fuel economy policy and measures. The GFEI has also been active in Australia (see below).

**Fuel Economy Initiatives in Australia**

The Australian Bureau of Statistics late 2010 report *9208.0 – Survey of Motor Vehicle Use Australia* reported that in that year passenger vehicles consumed 1 8431 million litres of fuel of which 84.1 per cent was petrol. It said that the year’s average rate of fuel consumption for passenger vehicles was 11.3 litres per 100 km, with petrol passenger vehicles having the rate of 11.1 litres per 100km, but gave no trend over time.\(^10\) Light commercial vehicles consumed a total of 5546 million litres of fuel.

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5. Ibid., p. 2.
6. Ibid., p. 3.
7. Ibid., p. 3.
8. Ibid., p. 3.
9. Ibid., p. 4.
Vehicle fuel efficiency standards

To assist vehicle purchasers, the Australian Department of Sustainability, Environment, Water, Population and Communities provides an online greenhouse gas emissions calculator along with the Green Vehicle Guide and information on the fuel consumption label system.\(^{11}\) The Guide is reportedly undergoing a review to better include electric vehicle ratings and total emissions cycles.\(^{12}\)

In its consumers’ guide, the Australian Automobile Association says that:

> New, affordable, clean and safe cars are an absolute priority to ensure the existing ageing fleet (average age 10.3 years) is replaced. Reduced operating and capital costs should be the goal to bring about these changes which will benefit the environment, road safety and the general cost of motoring.\(^{13}\)

**Political policies**

Looking then more widely than just fuel consumption to the resulting vehicle emissions, the 2010 Australian Labor Party election policy document *Emission standards for cars* states that:

> Carbon dioxide emissions from motor vehicles are usually measured in grams of carbon dioxide emitted per kilometre (g/km).

> According to the Federal Chamber of Automotive Industries, the national average for carbon dioxide emissions from new light vehicles in Australia in 2008 was 222 g/km.

> ...

> Average mandatory emission standards of 190 g/km by 2015 and 155 g/km by 2024 would represent cuts of 14 per cent and 30 per cent on 2008 levels respectively. These targets will be the starting point for further consultation.\(^{14}\)

By comparison, the Australian Greens (the Greens) election policy document, *Fuel efficient cars*, called for a tighter standard of 160 g/km of CO\(_2\) to be adopted for 2015, followed by a target of equivalence with the European standards by 2020. The Greens claimed, although it had not been finalised at the time of publishing the election policy document, that the European standard for 2020 would be 95 g/km of CO\(_2\).\(^{15}\)

**Moves towards improved fuel efficiency and lower CO\(_2\) emissions targets**

The GFEI convened a meeting of experts on LDV fuel economy and CO\(_2\) emissions standards in Melbourne on 2 March 2011. The experts considered potential avenues for regulation and

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\(^{11}\) Department of Sustainability, Environment, Water, Population and Communities website, accessed 4 July 2012.


complementary measures in preparation for a regulatory proposal on Australian standards for light vehicle CO₂ emissions. The experts concluded that while Australian standards need to be considered in the context of the current domestic fleet, they can be expected to generally follow the trend of regulations in other markets and evolve to a level which is between European and Japanese standards at the lower end of the fuel economy range, and US standards at the top end of the range.

Importantly, the then Bureau of Infrastructure, Transport and Regional Economics in 2009 noted a fuel efficiency trend for all terrain wagon-sports utility vehicles (ATW-SUV) ahead of light commercial vehicles (LCV):

New passenger cars have continued their downward trend in fuel consumption, with a steeper downward trend after 2004. Similarly, ATW-SUV fuel intensities are declining, possibly due to the emergence and popularity of the ‘compact’ and ‘medium’ ATW-SUVs. The LCV category, although somewhat volatile, has remained relatively flat and is the least fuel efficient part of the light vehicle fleet.

In late 2011, the Australian Minister for Infrastructure and Transport, Anthony Albanese, released a discussion paper that examined how to implement CO₂ emissions standards for new light vehicles, starting in 2015. The discussion paper did not set targets—rather it sought industry and community help to shape the new standards by presenting possible approaches for consideration and debate. Some 38 submissions were received in response to the discussion paper.

In March 2012, the National Transport Commission (NTC) published its report on ‘Carbon Dioxide Emissions from New Australian Vehicles 2011’, which found that:

Passenger cars and light commercial vehicles currently produce around 9 per cent of total Australian carbon dioxide emissions. This report finds there are significant fuel savings for Australians when choosing more fuel efficient and low carbon emitting vehicles.... The good news is that in 2011, carbon emissions from new vehicles reduced by 2.8 per cent compared to 2010. The data also highlights the fact that there is the potential to make a significant difference through greener car choices. The report finds that if Australians had purchased new vehicles with best-in-class emissions during 2011, these carbon emissions would be 38 per cent lower.

However, the NTC report showed that the average carbon dioxide emissions of new Australian cars were 198 g/km, compared to 136.1 g/km in Europe, or a 45 per cent difference. There would therefore seem to be a way to go before Australia meets the tougher European requirements. In

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18. The text of the Light vehicle CO₂ emission standards, discussion paper and the submissions in response to the discussion paper can be viewed at the Department of Infrastructure and Transport website, accessed 5 July 2012.
19. The discussion paper also provides information on target setting and splitting, possible regulatory models and current emission trends.
February 2013, it was claimed that the actual European figures over represented the true rate of improvement:

CO₂ emissions were 167.2 g/km in 2002 and 140.4 g/km by 2010, figures in the report showed, giving a total average reduction across new EU cars of 26.8 g/km. The study attributed 9.1 g/km, or roughly a third, to the way testing was performed, rather than improved technology.21

The National Transport Commission ‘Annual Report 2011-12 Delivering on priority reforms’ commented that on ‘Car Emissions must lower to ensure greener future’ (p.38):

• In 2011, the national average carbon emissions from new passenger and light commercial vehicles was 206.6 g/km. This is a 2.8 per cent reduction from 2010.

• In 2011, 15 manufacturers sold 93 per cent of the new light vehicles in Australia. Of these manufacturers, Suzuki had the lowest average corporate emissions (161 g/km) and Nissan the highest average corporate emissions (226 g/km).

• In 2011, the average emissions from Australian-made light vehicles was 230 g/km. This is a 6.9 per cent reduction from 2010.

• While there were more green vehicles available for sale in 2011, these vehicles were not among the best-selling vehicles.22

On ‘Contributing to the development of CO₂ standards for light vehicle emissions’ the report said that in regard to its response to the 2011 Australian Government discussion paper cited above:

The NTC submission contained information to help inform the development of the standards. This included a comparison of manufacturers’ emissions in Europe and Australia for 2010 and the changes in Australian car prices and new vehicle emissions over time. The submission also included an analysis of long-term targets for new light vehicles in 2050 (used to assist when setting the short and medium targets) and a recommendation that governments should consider introducing other complementary measures to reduce carbon emissions from light vehicles.

There will be other initiatives undertaken to improve vehicle efficiency, such as alternative fuels, electric drives, hybrid variations and technical improvements such as with powertrains.23 Here in Australia, we may play a small part in the global automobile manufacturing industry in particular niches, but perhaps with a potential to be influential.

Nations with vehicle fuel efficiency standards

Carbon dioxide emissions are a major constituent of vehicle exhaust emissions. Reduced fuel consumption is an effective way of reducing emissions of carbon dioxide and other greenhouse gases (GHGs), and also of managing oil consumption. The United States (US) Congressional Research Service (CRS) report *Regulation of Vehicle Greenhouse Gas Emissions: State and Federal Standards* notes that there are three ways to reduce vehicle GHG emissions:

1) reduce vehicle miles travelled (through strategies such as carpooling, transit, or teleworking)

2) reduce vehicle per-mile fuel consumption (through improved fuel economy) and per-mile non-carbon emissions (for example, fluorinated gas emissions from air conditioner systems) through improvements in vehicle systems and

3) convert to lower-carbon transportation fuels. Therefore, any program to reduce GHG emissions will likely raise fuel economy. Likewise, any program to increase fuel economy will lower GHG emissions.24

According to the International Council on Clean Transportation (ICCT), when a country is considering the type of standards to set, there are a number of choices including:

whether to set a single fleet-average standard or take a tiered approach, with multiple standards disaggregated according to vehicle footprint, weight, class, engine size, or interior size; which test cycle to adopt; and whether the standard should be voluntary or incorporate formal sanctions for noncompliance.25

The ICCT also has produced a *Summary Report on Low-Carbon Fuel Standards* which notes that there are various low carbon fuel-related standards in existence or near to implementation in the US and Europe.26 These include the US Federal Renewable Fuel Standard (US-RFS2), a California Low Carbon Fuel Standard (CA-LCFS), the European Renewable Energy Directive, a European Fuel Quality Directive and the UK Renewable Transport Fuel Obligation (RTFO). Canada is pursuing standards similar to California’s LCFS.

Table 1 summarises the policy approaches of a number of countries (as reported in May 2011). The policies in some of these countries are explained in more detail later in this paper. It can be seen

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that there are a variety of mandatory and voluntary standards, some applying to vehicle weight, engine size and distance.

Table 1: Worldwide Passenger Vehicle Fuel Economy and GHG Emissions Standards

<table>
<thead>
<tr>
<th>Country/Region</th>
<th>Type</th>
<th>Measure</th>
<th>Structure</th>
<th>Test Method</th>
<th>Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>Fuel</td>
<td>mpg</td>
<td>Footprint-based value curve</td>
<td>US CAFE</td>
<td>Mandatory</td>
</tr>
<tr>
<td>California</td>
<td>GHG</td>
<td>g/mile</td>
<td>Car/LDT1</td>
<td>US CAFE</td>
<td>Mandatory</td>
</tr>
<tr>
<td>European Union</td>
<td>CO₂</td>
<td>g/km</td>
<td>Weight-based limit value curve</td>
<td>EU NEDC</td>
<td>Voluntary for now, Mandatory by 2012</td>
</tr>
<tr>
<td>Japan</td>
<td>Fuel</td>
<td>Km/L</td>
<td>Weight-bin based</td>
<td>Japan 10-15/JC08</td>
<td>Mandatory</td>
</tr>
<tr>
<td>China</td>
<td>Fuel</td>
<td>L/100-km</td>
<td>Weight-bin based</td>
<td>EU NEDC</td>
<td>Mandatory</td>
</tr>
<tr>
<td>Canada</td>
<td>Fuel</td>
<td>L/100-km</td>
<td>Cars and light trucks</td>
<td>US CAFE</td>
<td>Voluntary</td>
</tr>
<tr>
<td>Australia</td>
<td>Fuel</td>
<td>L/100-km</td>
<td>Overall light-duty fleet</td>
<td>EU NEDC</td>
<td>Voluntary</td>
</tr>
<tr>
<td>Republic of Korea</td>
<td>Fuel</td>
<td>Km/L</td>
<td>Engine size</td>
<td>US CAFE</td>
<td>Mandatory</td>
</tr>
</tbody>
</table>


Table 2 summarises the measures to promote fuel efficient vehicles.

There is a correlation between increasing fuel efficiency and decreasing CO₂ emissions per litre of fuel consumed or per kilometre travelled. That is, an engine that is more fuel efficient will produce less CO₂ per unit of energy released. A car that is more fuel-efficient will consume less fuel and is therefore likely to produce less CO₂ per unit of distance travelled compared to a car of identical weight that is less fuel-efficient. Overall vehicle efficiency is a combination of engine efficiency and other factors such as transmission efficiency, vehicle weight and aerodynamics (reduced drag), for example.

It is interesting to note that the regulatory emphasis in the European Union (EU) is in reducing CO₂ emissions. In contrast, the emphasis in the US is on improving fuel efficiency. There appear to be no US plans to have any direct standards regarding CO₂ emissions although, of course, there are some general regulations on tailpipe emissions, as there are in Australia. In the case of China, whilst information is difficult to obtain, the emphasis would seem to be more on fuel efficiency. That said,
some more recent reports from the Innovation Center for Energy and Transportation (iCET) concentrate on Chinese vehicle fuel efficiency, given the rate of vehicular growth in that nation.27

Table 2: Measures to promote fuel efficient vehicles

<table>
<thead>
<tr>
<th>Approach</th>
<th>Measures/Forms</th>
<th>Country/region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standards</td>
<td>Fuel economy</td>
<td>US, Japan, Canada, Australia, China, Republic of Korea</td>
</tr>
<tr>
<td></td>
<td>GHG emissions</td>
<td>European Union (EU), California (US)</td>
</tr>
<tr>
<td>Consumer</td>
<td>Fuel Economy/GHG emission labels</td>
<td>Brazil, Chile, Republic of Korea, US and others</td>
</tr>
<tr>
<td>Awareness</td>
<td>Fiscal Incentives</td>
<td>EU, Japan</td>
</tr>
<tr>
<td></td>
<td>High fuel taxes</td>
<td>EU, Japan</td>
</tr>
<tr>
<td></td>
<td>Differential vehicle fees and taxes</td>
<td>EU, Japan, China</td>
</tr>
<tr>
<td>Support for new technologies</td>
<td>Economic penalties</td>
<td>US</td>
</tr>
<tr>
<td></td>
<td>R&amp;D programmes</td>
<td>US, Japan, EU, China</td>
</tr>
<tr>
<td></td>
<td>Technology mandates and targets</td>
<td>California (US), China</td>
</tr>
<tr>
<td>Traffic control</td>
<td>Incentives</td>
<td>California, Virginia and others states in the US</td>
</tr>
<tr>
<td>measures</td>
<td>Disincentives</td>
<td>Paris, London</td>
</tr>
<tr>
<td></td>
<td>Allowing hybrids to use high occupancy vehicle (HOV) lanes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Banning SUVs on City Streets</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Inner city congestion charges</td>
<td></td>
</tr>
</tbody>
</table>


According to the 2009 iCET *Revised Chart for World Standards*, as shown below in Figure 1, Australia appears in the middle of the range for fuel economy standards.28

27. iCET website, iCET project reports, accessed 2 July 2012.
The ICCT summarises the position as follows:

A great deal of regulatory action has taken place, and will continue to evolve, as governments around the world work to reduce GHG emissions and fuel consumption from passenger vehicles. Japan and Europe are leading the way on GHG emission reductions and fuel economy improvements in their light-duty vehicle fleets. California’s GHG emission regulations have now been adopted by 11 other states across the United States and received a legal boost from the U.S. Supreme Court. The EU is currently designing a legislative framework to deliver ambitious reductions in tailpipe CO₂ emissions, partially by moving from a voluntary approach to formal standards. Fuel economy standards in the U.S. are also undergoing an important public debate. Canada is planning to issue new fuel economy regulations this fall. China has adopted new tax policies to dampen demand for larger, less efficient vehicles. The nations with the greatest motor vehicle GHG emissions and fuel consumption will be critical actors on global energy and environmental issues. Decisions on how to meet and enforce GHG and fuel economy goals will affect not only domestic affairs, but also worldwide conditions for generations to come. ²⁹

There will be continuing debate on the standards used in different countries as they develop.

Differences between standards

This section looks at the arguments for and against Australia copying the EU or US standards. According to the 2007 ICCT report, the main difference lies between fuel usage and emissions:

Nine government entities worldwide—Japan, the European Union, United States, California, Canada, China, Australia, South Korea, and Taiwan, China—have proposed, established, or are in the process of revising light-duty vehicle fuel economy or GHG emission standards. Of the 30 Organization for Economic Cooperation and Development (OECD) nations, only five—Iceland, Mexico, Norway, Switzerland, and Turkey—do not currently have programs to reduce GHG emissions or petroleum use from passenger vehicles.

A number of different test procedures, formulas, baselines, and approaches to regulating fuel economy and GHG emissions have evolved over the last several decades. The policy objectives of these regulations vary depending on the priorities of the regulating body, but most standards are applied to new vehicles in order to reduce either fuel consumption or GHG emissions. There are important differences between these two approaches. Fuel economy standards seek to reduce the amount of fuel used by the vehicle per distance driven. Methods to do so may include more efficient engine and transmission technologies, improved aerodynamics, hybridization, or improved tires. GHG emission standards, on the other hand, may target either CO₂ or the whole suite of GHG emissions from the vehicle, such as refrigerants from the air conditioning system or nitrous oxide (N₂O) from the catalytic converter. GHG emissions standards may even extend beyond the vehicle to encompass the GHG emissions generated from the production of fuels.

... Certification of GHG emission and fuel economy performance for new vehicles is based on test procedures intended to reflect real world driving conditions and behavior in each country. The European Union, Japan, and the U.S. have each established their own test procedures. China and Australia use the European Union’s test procedures. California, Canada, and Taiwan, China follow the U.S. CAFE test procedures, while South Korea adopts the U.S. City test procedure.

... Over the last several decades, Europe, Japan and the United States have developed unique test procedures reflecting local real world driving conditions; as a result, the same vehicle tested on the Japanese test procedure may generate a markedly different fuel economy rating or GHG emissions than the identical vehicle tested on the U.S. or European test cycle.

US and EU standards

The US and Europe differ greatly in vehicle choices, driving habits and road types, and also in terms of fuel usage regulations. As detailed in the last section, the US has always been focused on fuel economy while, recently, the EU has been paying more attention to carbon emission efficiencies.

30 Ibid., pp. 10–11 [emphasis added].
This stems from the fact that a US energy bill stipulates carmakers will have average fuel efficiencies of 6.63 litres or less per 100 km 2016, while an EU directive mandates that passenger vehicles not surpass 130 g/km of CO₂ after 2012. On any new cars destined for a European market it is more common to find in the specifications a measure of the vehicle’s CO₂ levels per km, than an indication of the fuel efficiency. ³¹

Currently, the European standards are more stringent than those of the US, so European cars meet the US market requirements easily, but American cars generally need to be amended to enter the European market. Further, the European standards are harmonised with the United Nations Economic Commission for Europe (UN/ECE) vehicle emissions standards ³², which aim for global harmonisation of vehicle standards. ³³

Australia’s path

Countries of origin—import and export

From the US, only General Motors and the Chrysler group provide cars to the Australian market (Chrysler, Jeep and Dodge), and this amounts to less than two per cent of vehicle imports. ³⁴ Furthermore, as Chrysler is in partnership with two European manufacturers, Fiat and BMW, it is well served to meet either the American or European standards. ³⁵

On the other hand, based on 2009 sales figures, about 15 per cent of Australia’s light-vehicle imports are from European countries. ³⁶ Given that Australia imports more cars from Europe than the US, perhaps it is more logical to mimic the EU standards.

However, about 43 per cent of LDVs imported to Australia, and 36 per cent of the total market, originate from Japan. ³⁷ Japanese cars are inherently more fuel-efficient than the European, and certainly the US vehicles, mainly because they are much lighter. As a result, the choice of either EU or US standards should not affect the imports of cars from Japan, Korea or Taiwan. By adopting the less stringent fuel efficiency standard, Australia facilitates the diversity of imports.

On the other hand, if the aim is to maximise Australia’s opportunities to export Australian-made vehicles it would, of course, be to Australia’s advantage to impose the strictest standards at home to

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ensure that all international standards are met and Australian-made vehicles are suitable to export to all international markets.

**Demographic, Environmental and Economic Considerations**

In terms of demography and geography, Australia more closely resembles the US than Europe. Public transport is a more developed and better option in Europe than in any other continent. It is likely that both Australians and Americans drive further and more often than citizens of Europe, even if the latter tend to drive more nowadays, and subsequently have much bigger cars and engines. Given such factors, Australian standards possibly should be more closely matched to those of the US.

Of the two standards, the more stringent are those from the EU. So, if environmental issues were the driver, it would be preferable to follow suit with the EU. However, as explained above, the EU now refers to emissions per kilometre, rather than litres of fuel. Although fuel economy and emission reductions are related, in the long-term, European cars might actually become less fuel-efficient as they become fitted with more emission reduction technologies. American cars may continue to emit various pollutants even though they are travelling further on each litre of petrol.38 It is difficult to predict which path to follow as it depends on whether the emphasis is on reducing fuel consumption and CO₂ emissions, or improving air quality by reducing emissions of other pollutants.

On 16 November 2011, the Obama Government proposed new fuel economy and greenhouse gas standards for passenger cars and light trucks for model years 2017-2025.39 These proposed ‘CAFE’ standards are projected to require, on an average industry fleet-wide basis for cars and trucks combined, 40.1 miles per gallon (mpg) in model year 2021, and 49.6 mpg in model year 2025.40 The EPA’s proposed GHG standards, which are harmonized with NHTSA’s CAFE standards, are projected to require 163 g/mile of CO₂ in model year 2025.41

The EU directive for 130 g/km of CO₂ emissions by 2012 is much more stringent than current Australian emission standards, so it may be that meeting the European standards would be too onerous for Australian car manufacturers—causing a rise in the price of Australian-made vehicles to favour imported cars over Australian ones. A comparable percentage reduction might be more achievable for Australia.42 Table 3 below summarises the points made previously.

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40.  ‘CAFE’ means corporate average fuel economy. A fact sheet has been produced setting out the CAFE standards and the rationale for their introduction: [http://www.nhtsa.gov/staticfiles/ru...](http://www.nhtsa.gov/staticfiles/ru...)
Table 3: Comparison of EU and US standards

<table>
<thead>
<tr>
<th></th>
<th>PROS</th>
<th>CONS</th>
</tr>
</thead>
</table>
| EU Standards | • Harmonised with UN/ECE  
• Australia imports more cars from the EU  
• Currently the more stringent standard therefore better for greenhouse gas emissions reduction targets | • Improved fuel efficiency may lead to people driving more  
• Standards may be too tough (costly) for Australian manufacturers  
• Standards are too stringent, which limits imports from more lax countries |
| US Standards | • Improved fuel efficiency may lead to people driving more  
• Standards may be too tough (costly) for Australian manufacturers  
• Standards are too stringent so they limit imports from more lax countries | • Australia imports relatively few cars from the US  
• Focus on fuel economy may lead to highly polluting vehicles  
• Currently the less stringent standards therefore less environmentally friendly |

Source: Parliamentary Library.

Although standards are important for fuel efficiency, all the best efforts can be undone by careless vehicle maintenance. For example, driving at relatively constant speeds compared to stop-start conditions conserves fuel, as does making sure tyres are properly inflated. A study by Bridgestone Tyres Europe found that 93.5 per cent of cars in the EU have under-inflated tires:

“Softer tires increase rolling resistance, forcing the engine to work harder and burn more fuel. The US Department of Transportation says being down just 5 to 7 pounds per square inch can decrease fuel economy by two to three miles per gallon.”

In addressing on-road fuel efficiency, matters that may be considered include tested fuel efficiency (standards), fuel efficiency of components (non-engine components and whole of system approach), and driving/maintenance behaviour (‘ecodriving’ awareness). The 2007 ICCT report notes that:

Interestingly, countries as diverse as China, Canada, and Australia have adopted substantively equivalent regulations, with the carbon intensities of new vehicles sold in each country in the 2009-2010 time frame projected to be 168, 178, and 176 grams of CO₂-equivalent per km, respectively.

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44. M Richard, ‘93.5% of cars in Europe have under-inflated tires, wasting 2.14 billion gallons of fuel each year’, Treehugger website, 1 May 2008, accessed 2 July 2012.
Australian Vehicle Fuel Efficiency Standards

As to on-road performance, according to the Department of Transport and Infrastructure:

The emissions performance of vehicles once they are on the road (in-service) is the responsibility of the state and territory governments. However, the Australian Government has undertaken a number of studies to improve the understanding of emissions performance of the in-service passenger car fleet.46

The ‘Vehicles and the Environment’ website of the Department of Infrastructure and Transport provides general information on the current state of policy on vehicle emissions and efficiency:

The Department is responsible for managing policy and standards development on vehicle emissions, vehicle noise and fuel consumption labelling. The Department provides input on fuel quality issues and manages the environmental criteria for the fuel tax credit for heavy diesel vehicle operators. The Department also hosts and manages the Green Vehicle Guide website. ...To date, the principal measure used in Australia for reducing vehicle emissions and noise has been the through the introduction of tighter emission standards for new vehicles through the Australian Design Rules (ADRs). The Australian Government develops new vehicle emissions, noise and fuel consumption labelling standards via the determination of ADRs. These ADRs are made under Section 7 of the Motor Vehicle Standards Act 1989 and set the standards that each vehicle model is required to meet, prior to their first supply to the market.47

These standards have been in review. A report by the Vehicle Fuel Efficiency Working Group noted:

3.5.1 National Average Fuel Consumption Target.

The Australian Government and the Federal Chamber of Automotive Industries (FCAI) agreed a voluntary national average fuel consumption (NAFC) target for new passenger cars in 2003. That target is 6.8 L/100km for petrol passenger cars by 2010 (for a petrol vehicle, this target is approximately 162 g CO₂/km).

In 2004, the Australian Government and the FCAI commenced negotiations to align the target with the revised fuel consumption test procedures and to set an updated equivalent CO₂ based target covering all light vehicles. The parties were unable to reach an agreement on a revised target.

The FCAI has proposed a target of 222 g CO₂/km for all light vehicles, up to 3.5 tonnes, by 2010. The FCAI reports a 10 per cent improvement in the national average CO₂ emissions for all new light vehicles sold in Australia since 2002 (to approximately 226 g CO₂/km in 2007).48

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On 11 June 2011 the Minister for Infrastructure and Transport, Anthony Albanese, announced revised ADR requirements stating that the Government would ‘impose strict new emissions standards on all new cars, 4WDs and Utes sold in Australia’. The standards are equivalent to Euro 5 emissions standards for new model vehicles from 1 November 2013 and for existing models from 1 November 2016. In addition, Euro 6 emissions standards will commence for new model vehicles from 1 July 2017 and for existing models in Australia from 1 July 2018.

More recently, the Australian Government sought industry and community views in response to a Light Vehicle CO2 Emissions Standards Discussion Paper that examined mandatory 2015 carbon dioxide emissions standards for new light vehicles. Comments on the discussion paper were due by 9 December 2011. The outcome of that paper is discussed below.

As well, official figures reportedly showed that the use of diesel-fuelled cars by households has risen by more than 50 per cent over the past three years. An ABC News item of 26 October 2012 stated:

An Australian Bureau of Statistics study of motor vehicle usage has found 13 per cent of households are now driving diesel-powered vehicles, up from 9 per cent just three years earlier.

... Unleaded petrol remains the most popular fuel for households, with 83 per cent using petrol-engined cars.

However, within petrol-powered vehicles, there has been a distinct shift away from basic unleaded to premium fuels, with 14 per cent of households now using premium, up from just 8 per cent in 2009.

Meanwhile, an increase in fuel taxes would be justified if it prompted Australians to buy fuel efficient cars and drive less, a new study suggested. As reported by AAP, Dr Paul Burke and Dr Shuhei Nishitateno from the Australian National University examined how petrol prices in 132 nations influenced motorists’ decisions to buy fuel efficient vehicles, between 1995 to 2008:

They found a 10 per cent rise in the petrol price led to a three per cent reduction in fuel use.

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50. European emission standards define limits for the exhaust emissions of new vehicles sold in EU member states. Becoming progressively tighter over time, Euro 4 emission standards became effective in 2005, Euro 5 in 2008–2009, with Euro 6 to follow in 2014 for Light Duty Vehicles (LDVs). For example, under Euro 6, emissions from LDVs will be capped at 80 mg/km which represents an additional reduction of more than 50 % compared to the Euro 5 standard. See the Europa website, ‘Reduction of pollutants emissions from light vehicles’, accessed 4 July 2012.


Dr Burke says higher petrol prices could motivate people to buy more efficient vehicles in Australia.

"If petrol is expensive, consumers are less likely to opt for a gas guzzler," he said in a statement on Wednesday.

Dr Burke suggested a return to regular increases of the fuel excise at the rate of inflation.

In 2001, the Howard coalition government froze automatic indexation at 38.1 cents a litre.

The excise would be about 52.5 cents today if the previous program of half-yearly increases had continued.

"The revenue could be used to fund transport infrastructure and other priorities, or to reduce other taxes," Dr Burke said.

Petrol pump prices in Australia are lower than in Japan or Europe but higher than in the United States and Canada.

The national unleaded fuel price rose by an average 3.4 cents a litre to a 10-month high of 152.0 cents a litre last week, data from the Australian Institute of Petroleum showed.53

Associated issues

Fuel Issues

As vehicle emissions control technology becomes more sophisticated, the quality of the fuels is critical. The Fuel Quality Standards Act 2000 managed by the Department of Sustainability, Environment, Water, Population and Communities provides the capacity for the Australian Government to set limits on those fuel parameters which impact on environmental/health objectives, vehicle technology and vehicle operation.54 Standards for petrol, diesel, LPG and biodiesel address fuel properties that are considered important in facilitating the adoption of emerging vehicle engine and emission control technologies, and in managing ambient levels of pollutants identified as posing health and environmental problems.55

Inclusion of Fuel Consumption and CO2 Emissions Data in Promotional Material for New Light Vehicles

The report by the Vehicle Fuel Efficiency Working Group recommended that the Australian Government initiate discussions with the Federal Chamber of Automotive Industries and relevant advertising bodies, with a view to developing a code of practice regarding the inclusion of fuel consumption and CO2 emissions data in promotional material for new light vehicles.

consumption and CO₂ data in vehicle advertisements and promotional materials. Under the Council of Australian Governments’ National Strategy on Energy Efficiency, the Department of Infrastructure and Transport is responsible for working with the automotive industry on the development of an industry voluntary code of practice consistent with that recommendation. The Department says that it is currently holding discussions with key stakeholders in the vehicle and advertising industries in relation to the code.

**Australian Design Rules**

The means by which the Australian Government applies vehicle fuel efficiency standards is through the Australian Design Rules which already prescribe certain requirements, for example:

**ADR 79 - Emission Control for Light Vehicles**

The function of this Australian Design Rule is to prescribe exhaust and evaporative emission requirements for light vehicles in order to reduce air pollution.

**ADR 80 - Emission Control for Heavy Vehicles**

The function of this Australian Design Rule is to prescribe exhaust emission requirements for heavy vehicles in order to reduce air pollution.

**ADR 81 - Fuel Consumption Labelling for Light Vehicles**

The function of this Australian Design Rule is to prescribe the requirements for the measurement of vehicle fuel consumption and carbon dioxide (CO₂) emissions, and the design and application of fuel consumption labels to vehicles.

**Vehicle Air Emission Standards**

A related aspect to fuel efficiency rules are the air quality emission standards that currently apply in Australia. A December 2004 Regulation Impact Statement report contains some items of interest:

Major improvements in the emissions profile of the Australian vehicle fleet have already been achieved by adoption of earlier Euro vehicle standards and fuel quality standards introduced through the implementation of the Fuel Quality Standards Act 2000. These standards will lead to increasing improvements in air quality and provide health benefits over the next twenty years as our vehicle fleet turns over and older, more polluting vehicles leave the fleet. While

59. See ADR79; ADR79/01 and ADR79/02 on the ComLaw website.
60. See ADR80/00; ADR80/01 and ADR80/02 on the ComLaw website.
61. See ADR 81/01 and ADR 81/02 on the ComLaw website.
further reducing sulfur levels in fuels will have direct benefits, it is particularly the indirect
vehicle technology enabling effects of lower sulfur fuels that are most important.62

This paper has concerned itself with an emphasis on reducing fuel consumption and CO₂ emissions,
not on improving general air quality by reducing emissions of NOₓ, SOₓ, unburned HC, and CO. The
paper has as such not considered the possible effects of, and trends for, these pollutant chemicals.

Comparative Conclusion

To clarify then, the difference between fuel standards, emission standards and vehicle efficiency:

Motor vehicle emissions standards are national standards under the Motor Vehicle Standards
Act 1989. It is the responsibility of the National Transport Commission (NTC, formerly the
National Road Transport Commission) and the National Environment Protection Council to
develop and agree on new emissions standards, with formal endorsement required by the
Ministers of the Australian Transport Council for new standards, or for significant changes to
existing standards. Fuel standards are made by Ministerial determinations under the Fuel
Quality Standards Act 2000 after the Minister for the Environment has consulted with the Fuel
Standards Consultative Committee.63

Presumably then, any new vehicle efficiency standards will be prescribed under the ADRs.

The Government’s late 2011 discussion paper on how to implement carbon dioxide emissions
standards for new light vehicles from 2015 did not set targets, but asked industry and the
community to help shape the new standards by presenting possible approaches for consideration
and debate.64 The current discussion paper sets out the probable changes to the standard rules. The
paper states:

The issues discussed in the paper fall into two broad categories:

• the emissions target(s) to be established under the standards; and

• the most appropriate regulatory framework for implementing the standards.

... The average level of CO₂ emissions of the new light vehicle fleet in 2010 was just under 213
g/km. The average for the passenger car segment (which includes SUVs) was 205 g/km, with
light commercials averaging 250 g/km.

... When considered in annual percentage reduction terms, the US standards for example,
require an average reduction of 5.15% pa between 2011 and 2016 to achieve the standard and
the US EPA modelled reduction rates of 3–6% pa in its consideration of standards for 2025. In

62. Department of Transport and Regional Services, Regulation impact statement for vehicle emissions and fuel quality
standards for the post 2006 period, prepared on behalf of the Land Transport Environment Committee, December
64. ‘Light Vehicle CO₂ Emission Standards’, Department of Infrastructure and Transport website, accessed 5 July 2012.
the EU, the rates of reduction required to achieve the agreed standards are: Passenger cars -
2.0% pa to 2015 - 6.0% pa from 2016–2020.

... 3.1 Targets

While the Government’s election commitment clearly sets out a requirement for mandatory
CO₂ emissions standards, it did not specify the target CO₂ emissions that would be required
under the standard. The figures for 2015 and 2024 quoted in the election commitment (190g
CO₂/km and 155g CO₂/km, respectively), have been presented as a starting point for discussion
and do not represent a pre-determined target.⁶⁵

Some 38 submissions were received in response to the paper. The report goes on to discuss target
timetables in detail. Its further outcome is now awaited.

On 14 March 2013, the NTC reported that Australia’s average new car emissions reduced some 21
per cent over 11 years, through manufacturers adopting better technologies. The NTC stated that in
2012, the national average of (carbon dioxide) emissions from new passenger and light commercial
vehicles was 199 g/km.⁶⁶ Just prior to this release, the public transport provider lobby along with
local government representatives, cyclists, planners and other members promulgated the Moving
Australia 2030 Taskforce Report, which proposed that, by 2030 ‘the carbon emissions from the
passenger vehicle road transport sector be at least fifty per cent below 2000 levels’. Judging by the
statistics cited above, we are on the way to achieving the 2030 target.⁶⁷

Overseas trends are leading the way. Carbon dioxide emissions from new cars continue to fall in
Europe, according to preliminary figures released on 30 April.⁶⁸ It was reported in April 2013, that
the US National Research Council expects by the year 2050 that the United States could cut
petroleum consumption and greenhouse gas emissions by 80 percent for cars and small trucks,
through a combination of measures.⁶⁹ Such improvements may include better powertrain
technology.⁷⁰ Australia’s car industry may do well to participate in such future niche innovations.

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Glossary/Acronyms

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>ACEA</td>
<td>European Automobile Manufacturers' Association</td>
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<tr>
<td>ADRs</td>
<td>Australian Design Rules for motor vehicles</td>
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<tr>
<td>ATC</td>
<td>Australian Transport Council</td>
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<tr>
<td>CAA</td>
<td>Clean Air Act (US)</td>
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<td>CAFE</td>
<td>Corporate Average Fuel Economy (US) standards for passenger cars and light trucks</td>
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<tr>
<td>CARB</td>
<td>California Air Resources Board (US)</td>
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<tr>
<td>CARS</td>
<td>Consumer Assistance to Recycle and Save Act 2009 (US) (Ceased in 2011)</td>
</tr>
<tr>
<td>COAG</td>
<td>Council of Australian Governments</td>
</tr>
<tr>
<td>CO₂</td>
<td>Carbon dioxide emissions from fuel combustion are a major source of vehicles outputs.</td>
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<tr>
<td>CRS</td>
<td>Congressional Research Service (US)</td>
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<td>ECE</td>
<td>Economic Commission for Europe</td>
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<tr>
<td>EISA</td>
<td>Energy Independence and Security Act 2007 (US)</td>
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<td>EPA</td>
<td>Environmental Protection Agency (US)</td>
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<td>EPHC</td>
<td>Environment Protection and Heritage Council (Australia)</td>
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<tr>
<td>EU</td>
<td>European Union</td>
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<tr>
<td>FCAI</td>
<td>Federal Chamber of Automotive Industries (Australia)</td>
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<tr>
<td>FES</td>
<td>Fuel Economy Standards (China)</td>
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<tr>
<td>GFEI</td>
<td>Global Fuel Economy Initiative</td>
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<tr>
<td>GHG</td>
<td>greenhouse gas emissions</td>
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<tr>
<td>ICCT</td>
<td>International Council on Clean Transportation</td>
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<tr>
<td>ICET</td>
<td>Innovation Center for Energy and Transportation</td>
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<tr>
<td>IEA</td>
<td>International Energy Agency</td>
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<tr>
<td>ITF</td>
<td>International Transport Forum</td>
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<tr>
<td>JAMA</td>
<td>Japan Automobile Manufacturers’ Association</td>
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<tr>
<td>KAMA</td>
<td>Korean Automobile Manufacturers’ Association</td>
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<tr>
<td>METI</td>
<td>Ministry of Economy, Trade and Industry (Japan)</td>
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<tr>
<td>MLIT</td>
<td>Ministry of Land, Infrastructure and Transport (Japan)</td>
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<tr>
<td>NACE</td>
<td>National Average Carbon Emissions (Australia)</td>
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<tr>
<td>NAFC</td>
<td>National Average Fuel Consumption (Australia)</td>
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<tr>
<td>NDRC</td>
<td>National Development and Reform Commission (China)</td>
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<td>NEDC</td>
<td>New European Driving Cycle vehicle test</td>
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<td>NHTSA</td>
<td>National Highway Traffic Safety Administration (US)</td>
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<td>NOPR</td>
<td>Notice of Proposed Rulemaking (NHTSA - US)</td>
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<tr>
<td>N₂O</td>
<td>nitrous oxide emissions from the catalytic converter</td>
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<tr>
<td>OECD</td>
<td>Organisation for Economic Cooperation and Development</td>
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<tr>
<td>UNEP</td>
<td>United Nations Environment Programme</td>
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<tr>
<td>US</td>
<td>United States</td>
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</tbody>
</table>
Important Unit Conversion Factors

The Table shows common unit conversion factors. In each case, mpg refers to gasoline only.

<table>
<thead>
<tr>
<th>METRIC</th>
<th>STANDARD X</th>
<th>STANDARD Y</th>
<th>CONVERSION</th>
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</thead>
<tbody>
<tr>
<td>Fuel economy</td>
<td>km/L</td>
<td>mpg</td>
<td>Y = X * 2.35</td>
</tr>
<tr>
<td></td>
<td>L/100 km</td>
<td>mpg</td>
<td>Y = 235.2/X</td>
</tr>
<tr>
<td></td>
<td>CO₂ g/km</td>
<td>mpg*</td>
<td>Y = 5469/X</td>
</tr>
<tr>
<td>GHG standard</td>
<td>km/L</td>
<td>CO₂ g/km</td>
<td>Y = 2325/X</td>
</tr>
<tr>
<td></td>
<td>L/100 km</td>
<td>CO₂ g/km</td>
<td>Y = X * 23.2</td>
</tr>
<tr>
<td></td>
<td>mpg</td>
<td>CO₂ g/km</td>
<td>Y = 5469/X</td>
</tr>
</tbody>
</table>

* For diesel vehicles, Y – 6/424/X was used to reflect the higher carbon content of diesel fuel.