



Managing Vehicle Carbon Emissions Options for development of a standard

August 2010

Federal Chamber of Automotive Industries
10 Rudd Street, Canberra, ACT 2601

For the attention of Tim Reardon, Director –
Government Policy

August 2010

Dear Tim

[Report prepared by PricewaterhouseCoopers \(“PwC”\) in connection with
New Vehicle Carbon Emissions Standards](#)

Thank you for the opportunity to provide you with this report in accordance with our engagement letter dated 19 January 2010, including the terms and conditions attached to our proposal dated December 2009.

This report has been prepared for the Federal Chamber of Automotive Industries (“**FCAI**”) in accordance with the scope of our engagement, that relates to the Australian Government’s provision of a Regulatory Impact Statement addressing carbon emissions standards for light vehicles.

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If you require any clarification or further information, please do not hesitate to contact me on 02 8266 2730.

Yours sincerely



Jeremy Thorpe
Partner

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Section 1

Executive summary

Executive summary

Scope of work

- PricewaterhouseCoopers (PwC) has been engaged by the Federal Chamber of Automotive Industries (FCAI) to undertake analysis to assist in the development of a standard for new motor vehicle carbon dioxide (carbon) emissions in Australia.
- FCAI requires delivery of analysis in relation to three tasks, being:
 - Task 1 – the development of an ambitious, robust and achievable emissions target,
 - Task 2 – options for a framework for achieving an emissions target, and
 - Task 3 – consideration of other policy initiatives, including an emissions trading scheme.
- FCAI intends to use this report as part of its contribution to the development of an Australian Government Regulatory Impact Statement (RIS) to assess the costs and benefits of introducing CO2 emission standards for light vehicles.
- The RIS will assess the impact of both voluntary and mandatory standards on the Australian automotive industry and how complementary such standards are with Australian Government climate change policy, including the Carbon Pollution Reduction Scheme (CPRS).
- The RIS applies to “light vehicles” as defined in Australian Design Rules, “being 4 wheeled road vehicles with a gross vehicle mass of 3.5 tonnes or less, whether imported or locally manufactured”. This definition includes passenger and goods carrying vehicles.

Key findings

PwC Task 1 – The development of an ambitious, robust and achievable emissions target or standard:

- **Modelling approach.** The development of any target should commence with an understanding of base case (also referred to as “business as usual”) emissions from the base year onwards. PwC modelled the base case for new motor vehicle emissions following consultation with Australian new vehicle manufacturers and importers (automotive industry) representing 67% of the Australian market. These automotive industry representatives were surveyed in relation to their new technology expected to be introduced and changes to the market share of particular vehicle classes.
- **Assumptions.** Consistent with the RIS requirements, the modelling assumed:
 - No new regulations/changes to existing regulations impacting the automotive industry,
 - No changes to government provided incentives, and
 - No changes to relative fuel prices.
- **Modelling estimates.** New motor vehicle carbon emissions are estimated to be 194.6 to 202.1 g CO2/km by 2015 and 176.1 to 189.4 g CO2/km by 2020 (noting that the lower end of range is determined by the notional savings generated by new technology, and upper end includes the application of market segment projections).
- **2015 targets.** This constitutes a 9.1 to 12.5% saving per vehicle in terms of carbon emissions by 2015 when compared with the National Average Carbon Emissions (NACE) in the base year, being 2008, which was 222.4 g CO2/km. and against 2000 levels it is a 14.8 to 20.8% saving.

Executive summary (continued)

Key findings (cont.)

PwC Task 1 – The development of an ambitious, robust and achievable emissions target or standard (cont.)

- **Primary measure.** Any new standard for new vehicle carbon emissions should take into account the Australian Government's policy, which requires that Australia's baseline emissions should reduce by between 5% and 25% of 2000 levels by 2020 (including the transport sector and new vehicle emissions). This policy was recently confirmed by the Australian Government to the international community in Copenhagen. An emissions trading scheme has been the primary climate change reductions measure to achieve those emissions reductions.
- **2020 projections.** From a comparison of carbon emissions savings from new vehicles by 2020 against 2000 levels, projected carbon emissions savings could be as high as 20.8%, assuming the kilometres travelled and all other factors remain constant.
- **Potential optimism bias.** The base case includes projected uptake of new technologies and changes in market segments in accordance with estimates provided by manufacturers and importers. However, there is a risk that these estimates include optimism bias (i.e. projections for these modelling inputs are systematically overestimated by car manufacturers and importers), resulting in overstated carbon savings. This should be taken into account when setting a target and developing a standard.

PwC Task 2 – Options for a framework (standard) for achieving an emissions target:

- **Framework options.** The three high level options for a standard that are available to the Australian Government are:
- **Option 1 – Maintain current standard.** Update the voluntary NACE target to reflect the base case projections. This would involve the automotive industry unilaterally determining a single industry-wide self-enforced target.

- **Option 2 – Government / Industry co-developed voluntary standard.** An alternative to the voluntary NACE target would be for the Australian Government to co-develop a new voluntary standard with the automotive industry. Types of voluntary standards that have been considered are:
 - Corporate average target,
 - Corporate average target segmented by mass or wheel base, and
 - Individual vehicle targets.
- Offsets could be made available to recognise emission reduction benefits of low emission vehicles and alternative fuels. Similarly, recognition of safety initiatives is also important.
- In relation to the form of co-developed standard, the following are possible:
 - Understanding between the automotive industry and Government (MOU),
 - Industry self regulation underpinned by MOU,
 - Corporation opt-in to a binding contract, and
 - Corporation opt-in to non-binding standards.
- All of these forms of voluntary standards could provide the opportunity for the automotive industry to continue to self regulate through effective governance and enforcement structures. For example, through appointment of an expert panel or other administrative arrangements.
- **Option 3 – New mandatory standard.** The Australian Government may decide to mandate a standard through new regulation. In effect, this approach takes the industry led option 2 and adds government monitoring and enforcement of the standard.

Executive summary (continued)

Key findings (cont.)

PwC Task 3 – Consideration of other policy initiatives, including an emissions trading scheme:

- **Consideration of international approaches.** International approaches in Japan, China, South Korea, European Union and United States were all considered in preparation of this report. Australia is not able to adopt one of these approaches (without appropriate adjustment) due to key differences in:
 - Drive cycle, being the testing protocols adopted for carbon,
 - Coverage, such as whether passenger vehicles, SUVs and light commercials are covered,
 - Fuel quality, such as the availability of higher quality fuels in Europe,
 - Incentives and other taxation measures impacting manufacturers and consumer choice, and
 - Significant numbers of imported vehicles in Australia and the fact that over 50% of new motor vehicles manufactured in Australia are exported.
- **Consistency with international measures.** Unlike the EU and emissions trading schemes proposed in other jurisdictions, the (delayed) Australian CPRS would cover new vehicle emissions. However, assuming that there is a compelling reason for introducing a new vehicle carbon emissions standard, it would be correct for Australia to set a target that is consistent with international commitments, in terms of the proportion of savings to be achieved.
- **Measurement approach.** The findings in this report take into account the labelling requirements under *Vehicle Standard (Australian Design Rule 81/02 – Fuel Consumption Labelling for Light Vehicles) 2008* ([ADR 81/02](#)), which provides criteria for recording emissions of new vehicles and their mass.

Analysis and recommendation

Recommended framework for standard

- **Target setting approach.** To be consistent with Australia's emissions reductions targets of 5% - 25% of 2000 levels by 2020 and targets in other country jurisdictions, the carbon emissions reduction target will need to be aspirational. The base case identified in this report should, in itself, be considered aspirational for target setting, particularly where companies within the automotive industry have provided us with sales projections. Forecast sales projections often need to be adjusted (down) to allow for optimism bias.
- **Legislative or non-legislative standard.** The *Vehicle Fuel Efficiency Working Group Final Report* prepared for the Council of Australian Governments expressed the view that legislative measures are preferred, so we assume a legislative measure is a more likely outcome following the RIS framework. However, we do note that the recommended framework for a standard proposed in this report could be implemented through legislation or an agreement.

Executive summary (continued)

Analysis and recommendation (cont.)

Recommended framework for standard (cont.):

- **Who does it apply to?** The proposed target and resulting framework would bind corporations that supply vehicles into the Australian market (i.e. Australian manufacturers and importers), because they have the greatest level of control over vehicle types introduced to Australia and are the simplest to administer. It will be desirable to utilise the infrastructure already in place, such as the process for recording individual new vehicle emissions under ADR 81/02 and the industry adopted NACE target.
- **Type of target.** Having reviewed the options and criteria presented on page 26, we recommend that FCAI further investigate a percentage reduction commitment in the form of a Corporate Average Carbon Emissions (**CACE**) target because:
 - A CACE target is simpler than segment or individual vehicle targets, as there will only be one target set per corporation based on historical emissions and the base case; and
 - A CACE target provides the corporation with the greatest degree of flexibility as to how it will achieve the reduction target.
- **What does a CACE target cover?** Under a mandatory CACE target standard, each corporation would be required to comply with published target, being the maximum carbon emissions allowable for all new vehicles sold by that corporation. That target will be set according to historic emissions and phased in according to emissions intensity above the industry baseline.
- **Materiality test.** Certain vehicle types may be excluded from coverage (such as those covered under a specialist and enthusiast scheme, emergency service and military vehicles).
- **Proposed flexibility in design:**
 - **Pooling.** A corporation that expects to exceed the allowable emissions from sales in a given year, can agree with another corporation to pool emissions rather than pay a penalty.
- **Banking & borrowing.** Banking additional emissions savings against the target would be allowable for the duration of a production cycle (allow 3 years, based on industry consultation). Borrowing forward against projected savings from sales of a new vehicle type would also be allowable (again, for a period of 3 years based on industry feedback).
- **Recognition of eco-technologies.**
 - From consultation during preparation of this report, we understand that some technologies are not assessed through the vehicle test procedures under ADR 81/02, such as advanced air-conditioning gases, which can reduce new vehicle carbon emissions. Flexibility should be considered to lessen the CACE target obligation for new vehicles to take this reduction into account. There are a number of available methodologies to measure the reductions achieved against an industry baseline.
 - Similarly, consideration could be given to adjusting the CACE target obligation (i.e. a credit) for the use of preferred technologies (e.g. alternative fuels, LEVs, e85, etc). This may be a low cost way to encourage the uptake of such technologies in vehicles.
- **Penalties.** Penalties should be applied on a per vehicle basis for an exceedance above the industry target. The penalty should be calculated by reference to a forecast carbon price so that the penalty is applied in terms of \$ per gram of CO₂ per vehicle (i.e. similar to an obligation to “*make good*” for exceedances under the CPRS and other mandatory measures). Appendix 2 contains forecasts that contain reasonable assumptions for setting a penalty range.
- **Use of revenue.** Revenue from penalties and administrative charges would subsidise the costs of scheme administration or be applied to incentivise emissions reduction. Incentive priorities would be determined in consultation with the new vehicle industry in Australia.
- **Phase in.** A phase-in of vehicles covered by the standard over time could be appropriate to minimise the risk of distortion in market conditions as well as allowing consumers enough time to adjust to changes to vehicle ranges. Any standard needs to take into account the fact that a usual production cycle is at least 3 years, so this needs to be taken into account when a standard is being set.

Section 2

Background

What is being considered?

In March 2009, the Vehicle Fuel Efficiency Working Group (jointly established by the Ministers of the Australian Transport Council (ATC) and the Environment Protection and Heritage Council (EPHC)) recommended that the Australian Government undertake a detailed Regulatory Impact Statement to assess the costs and benefits of introducing carbon emission standards for light vehicles (ATC and EPHC 2009, p 26).

In July 2009, the Council of Australian Governments (COAG):

- Considered the recommendations of the vehicle fuel efficiency report and agreed to incorporate these recommendations into the National Strategy on Energy Efficiency (NSEE) (refer Appendix 1)
- Released a strategy communiqué (2 July) stating that it had endorsed the NSEE which included a commitment to undertake a Regulatory Impact Statement (RIS) to assess the costs and benefits of introducing carbon emission standards for light vehicles: the RIS will assess the impact of both voluntary and mandatory standards on the automotive industry and the complementarity of measures with the CPRS. COAG will make a final decision following thorough consultation with industry and the community.
 - The RIS applies to “Light vehicles” as defined in Australian Design Rules, “being 4 wheeled road vehicles with a gross vehicle mass of 3.5 tonnes or less, whether imported or locally manufactured”, and applies to passenger and goods carrying vehicles.

The RIS is required to address:

- The case for carbon standards (voluntary or mandatory),
- The costs of reducing vehicle carbon emissions through standards, and
- The benefits if expected emissions reductions occur.

We note that the RIS excludes consideration of:

- Existing on-road vehicle emissions,
- Other potential measures such as fiscal incentives, consumer information, scrappage programs, alternative fuel policies and travel behaviour change programs,
- Lifecycle (production, use and disposal) carbon emissions from the vehicle, or from fuel used in the vehicle, and
- Fuel price modelling, although the RIS can consider price assumptions from Treasury modelling.

However, these factors are relevant to the COAG Communiqué and the recommendations in the Vehicle Fuel Efficiency Working Group final report. Therefore, this report provides comment on the factors relevant to setting an emissions standard for vehicles more broadly.

In order to assist the RIS process, this report:

- Calculates the industry base case for new vehicle emissions reductions based on industry consultation and data,
- Provides industry input to the RIS process with respect to setting a new vehicle carbon emissions standard, and
- Provides comment on relevant issues that are excluded from the RIS approach (i.e. the importance of considering existing on-road vehicle emissions, other incentives and lifecycle emissions).

How effective will a vehicular target/standard be in reducing carbon emissions?

New vehicle emissions – context

- Emissions from the transport sector contribute 80Mt CO₂e per year which is 14.5% of the national Australian carbon inventory of 552 Mt CO₂e per year (refer Australian Government – National Greenhouse Inventory dated May 2009 (NGGI)).
- Appendix 3 contains NGGI data which demonstrates the contribution of carbon emissions from vehicles.
 - In 2009 there were a total of 15.67 million vehicles in Australia – 12.02 million passenger vehicles, 2.37 million light commercial vehicles, 624,000 motor cycles, 421,000 rigid trucks, 84,000 buses and 150,000 other vehicles (refer to the “*Motor Vehicle Consensus 31 March 2009*” sourced from the Australian Bureau of Statistics (ABS)).
 - By comparison the new car market is 1 million cars per year (per FCAI data).
- **Implications** – The contribution to emissions reduction proposed in the RIS is relatively small compared with total transport emissions. Other measures will also need to be considered to achieve industry wide emissions reductions.

Existing government policy to reduce vehicle emissions

- Current Australian Government policy is the reduction of total emissions by between 5% and 25% of 2000 level emissions by 2020, including transport sector emissions. This policy covers direct emissions from activities attributed to road freight transport, road passenger transport and related transport services (refer ANZSIC Codes listed in Schedule 2 to the *National Greenhouse and Energy Reporting Regulation 2008*, as amended)
- Emissions from new vehicles are reportable under the National Greenhouse and Energy Reporting (NGER) scheme, either as a vehicle fleet that meets the definition of an NGER ‘facility’, or an activity that forms part of (i.e. ancillary) to another NGER facility.

- The CPRS was formerly the Australian Government’s primary regulatory measure to implement its emissions reduction policy. With the announcement on 27 April 2010 of the deferral of the CPRS to 2013 at the earliest, we anticipate a desire by the Australian Government to introduce new regulatory measures to achieve emissions reductions from new vehicles.
- **Implication** – A consequence of the deferral of the CPRS is that we anticipate a desire by the Australian Government to introduce new regulatory measures to achieve emissions reductions targets across sectors, including transport.

Observations on the target setting approach

- The limitations in terms of quantity of achievable savings should be acknowledged as part of the RIS.
 - The automotive industry has achieved substantial year on year emissions reductions from new vehicles under the current NACE target approach. Projected base case reductions are represented in section 3 of this report to 2015 and 2020. From review of this base case projection it appears that there is no urgent or compelling case for regulation of new vehicle carbon emissions.
 - The potential for emissions savings from existing on-road vehicles should be investigated, because on-road operation of vehicles is not addressed by the RIS.
 - The issue of complementarity with the CPRS needs to be addressed in the RIS by answering the question of whether there is a demonstrable and compelling case for introduction of another mandatory standard. Given the Australian Government’s recent announcement to defer implementation of the CPRS until after 2012, it would not be difficult to establish such a case.

Can we just adopt overseas vehicular carbon emissions standards?

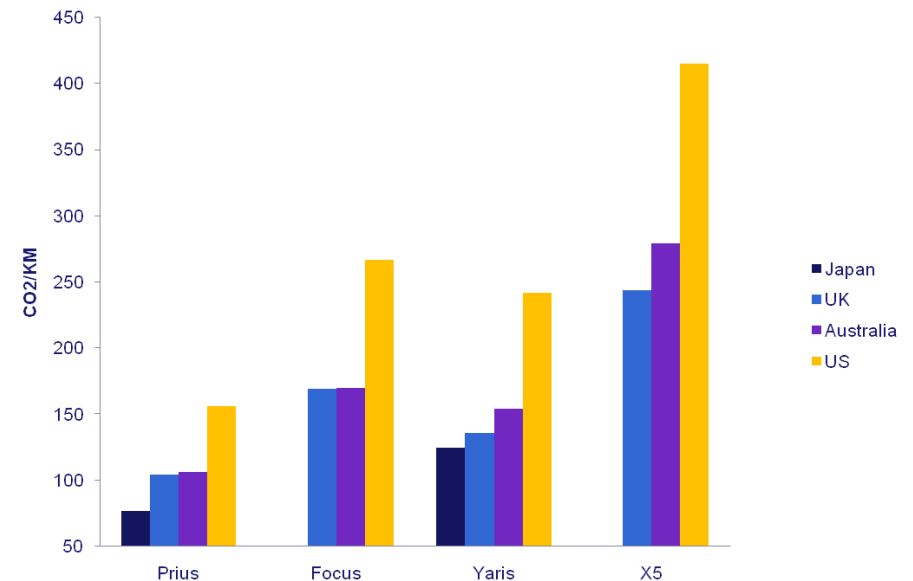
While there is an intuitive appeal in suggesting that Australia should simply adopt overseas assisting targets, this is not a practical policy approach. There is no simple means by which Australia could adopt international vehicular emissions standards. The major issue is that there is no international consistency between standards. For example, major economies like the US, Japan, European Union, China and South Korea all take a different approach to setting standards for reducing new motor vehicle emissions. This is illustrated by the summary of the US, European and Japanese standards in Appendix 4.

- **Implication** – Standards have been developed based on criteria that best suit each jurisdiction, without an agreed overarching framework that Australia can adopt.

From consultation with the automotive industry, the other reasons why international standards cannot be automatically adopted in Australia include:

- **Reason 1 – Different drive cycles in each jurisdiction**
 - The protocols used for testing in each jurisdiction are different, which impacts new vehicle carbon emission estimates in these jurisdictions (refer to Figure 1). For example the US applies different tests to those used in Australia under ADR 81/02. This means that there is no easy way to translate standards across different countries.
- **Reason 2 – Coverage of vehicles**
 - ADR 81/02 applies to all light vehicles up to 3.5 tonnes. International standards in Europe, Japan and most other countries do not apply to larger vehicles such as light trucks and buses.
- **Reason 3 – Fuel quality**
 - The fuel mix in each country is different, with different fuel quality standards available internationally.
 - Through consultation with the automotive industry we were informed that the petrol sulfur content standard in Australia may restrict the uptake of new technologies.

Figure 1 The impact of different drive cycles in various countries on new vehicle carbon emission estimates



Source: FCAI, Carbon emission standards, presentation, 10 February 2010

- **Reason 4 – Exemptions and credits**
 - Overseas standards have been established in environments that include different credits and exemptions for electric vehicles, bio-fuels and air conditioning.

Can we just adopt overseas vehicular carbon emissions standards?

- **Reason 5 – Importance of tax incentives and subsidies**
 - Other jurisdictions have additional policy measures that influence and consumer demand toward LEVs. These policy measures include fuel subsidies, grant funding for low emissions vehicle manufacture, taxation incentives for vehicle manufacture and scrappage schemes. These measures significantly influence the uptake of new vehicle technology and hence result in lower emissions than would otherwise be achievable in Australia.
- **Reason 6 – Different consumer preferences**
 - The automotive industry is responsive to consumer choice, which is influenced by factors such as transport infrastructure, geography and road quality. For example, the automotive industry view is that the Australian market has traditionally been used to much larger vehicles and a higher proportion of automatic vehicles that are less efficient (compared to Europe and Japan), so average vehicle emissions would be higher due to increased vehicle mass.

Section 3

Projected future vehicular carbon emissions

The process for developing forecasts of future emissions

Modelling methodology

Overview

We have developed a model of future vehicle emissions in the context of the following observations:

- The assessment is based on a literature review and consultation with car manufacturers/importers representing 67% of the Australian market.
- Carbon emissions reductions (%) are measured relative to 2008 levels (consistent with the RIS).
- Modelling was conducted for each vehicle segment as defined in the FCAI “*Combined Fuel Economy and Carbon Dioxide Emission Report*”.
- Technology categories and emissions savings were based on a report prepared for the UK Government entitled “*King Review of low-carbon cars (UK)*” Parts 1 and 2 ([King Review](#)) and tested with the automotive industry. Technology changes were modelled for each vehicle manufacturer and importer, with specific allowances made for
 - Whether the technology is likely to be introduced,
 - The expected year of introduction, and
 - Estimated emission savings.
- We have not modelled the ultimate costs of technologies. That is, while the model addresses the benefit of emission reduction initiatives it does not identify the costs expected to achieve the identified savings.
- Market share projections are based on consultation with FCAI and the automotive industry.

General assumptions

Consistent with the RIS requirements, the modelling assumes:

- No new regulations/changes to existing regulations impacting the car industry,
- No changes to government incentives (for consumers or the automotive industry), and
- No changes in relative fuel prices.

Technology assumptions

- Technologies from the King Review which have been specifically canvassed in this review include:
 - Petrol and diesel direct injection,
 - Variable valve actuation,
 - Smaller capacity engines (e.g. due to turbo-charging/supercharging, clean diesel or light-weighting),
 - Dual clutch transmission,
 - Stop-start,
 - Regenerative braking,
 - Reduced mechanical friction components,
 - Light-weighting,
 - Low resistance tyres, and
 - Improved aerodynamics.
- Hybrids (i.e. electric motor assist) and electric vehicles were modelled as separate vehicle classes, not a technology. Emissions are assumed to be 125 g CO₂/km for Hybrid passenger vehicles, 145 g CO₂/km for Hybrid SUVs and 0 g CO₂/100 km for electric vehicles.
- Biofuels (e.g. E85) have not been specifically modelled.
- Technologies are implemented over 10 years with diminishing marginal returns.
- Technologies are implemented in passenger vehicles first with a delay for subsequent adoption in commercial vehicles.

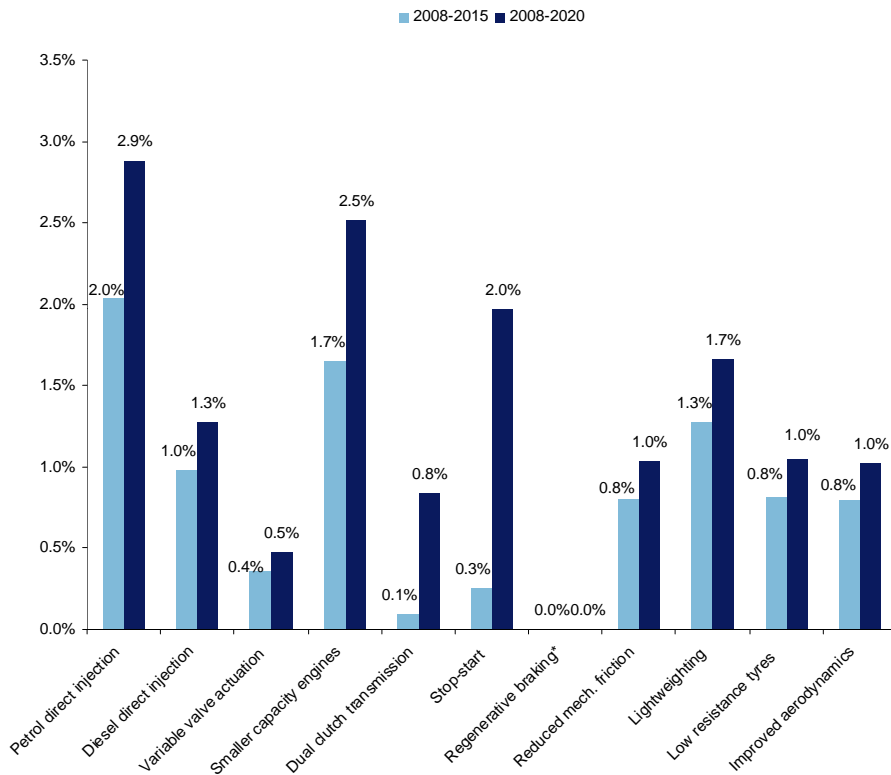
The process for developing forecasts of future emissions (continued)

- Emission reductions achievable for each technology are assumed to be the same for all passenger vehicles (with the exception of direct injection, which was separated into petrol and diesel technologies).
- Estimated emissions savings in the King Review are optimistic as they have assumed that technologies are cumulative and many of the savings have already been realised.
- Not all technologies are cumulative (i.e. some are alternatives or do not work effectively in joint adoption).
- Regenerative braking is only applicable to hybrids/electric vehicles.
- The members of the automotive industry consulted (67% of sales volume) are assumed to be reflective of the entire industry.
- Projections for each automotive industry participant are weighted by the proportion of sales relative to the total sales of those consulted.
- Carbon emissions reductions (%) were measured relative to 2008 levels, consistent with the approach being adopted in the RIS.
- Savings achieved due to lightweighting were reduced from those identified in the King Review due to offsetting increases in weight due to safety requirements and consumer preferences for comfort/luxury.

The process for developing forecasts of future emissions (continued)

Technology – derived emission savings

Figure 2. Emissions savings (relative to 2008) for each vehicle technology



Source: Confidential consultation with car manufacturers/importers

* Regenerative braking only applies to hybrid vehicles.

Note: Except in the case of direct injection, it was not possible to separate technologies into petrol and diesel components as this level of detail was not provided by car manufacturers/importers

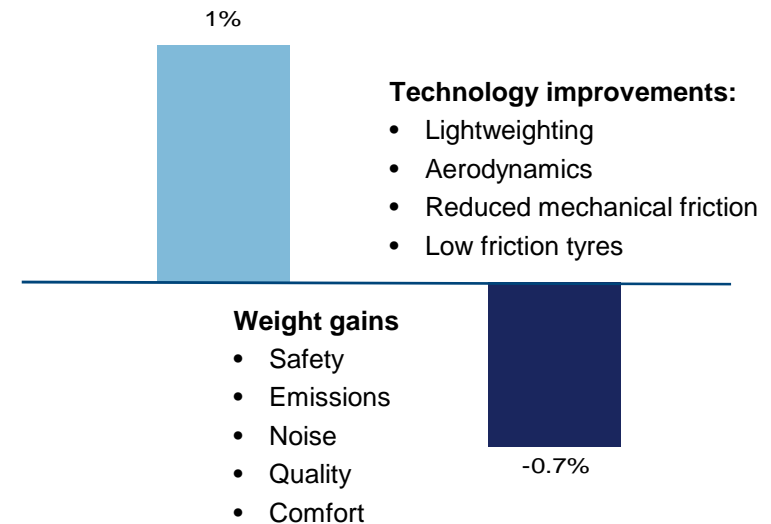
Weight increases offset efficiency gains

In Figure 2, the estimated emissions savings are due to reduced mechanical friction components, lightweighting, low resistance tyres and improved aerodynamics. We note there are net increases in weight due to:

- regulations (e.g. safety requirements), and
- consumer demands (e.g. for luxury items and safety).

Historically, every 1% increase in fuel efficiency due to technology improvements has been offset by a 0.7% reduction in efficiency due to weight increases (refer to Figure 3)

Figure 3. Efficiency gains from technology versus efficiency losses from weight increases

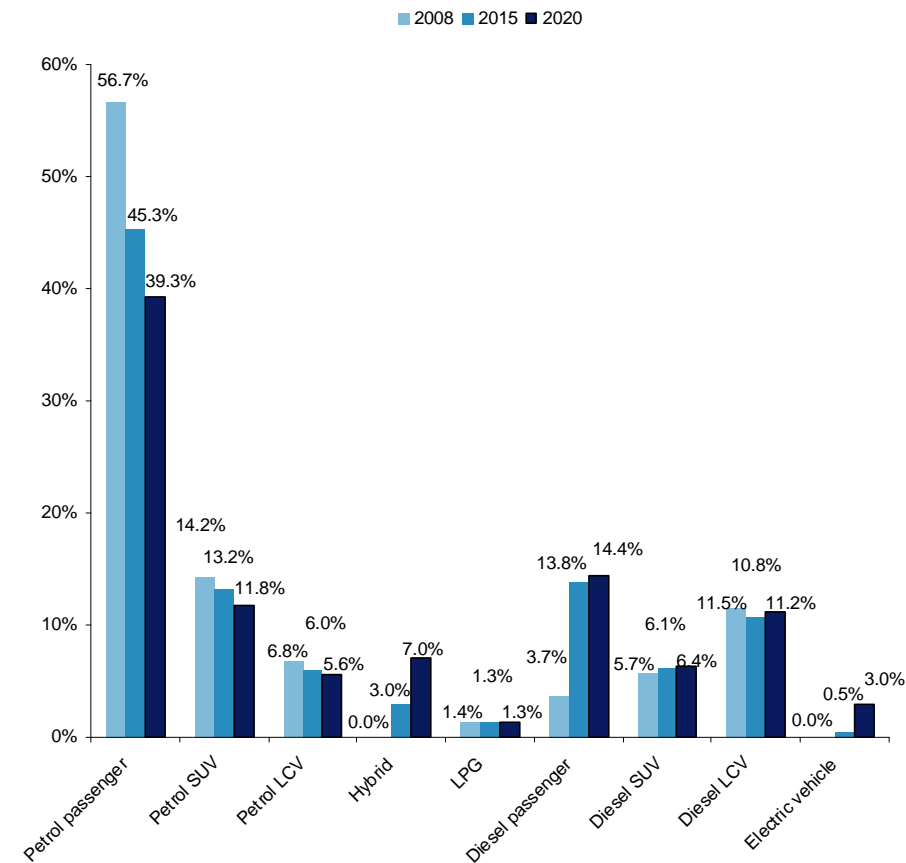


Source: ACEA (2002) ACEA's carbon Commitment, p 13

The process for developing forecasts of future emissions (continued)

Market segment projections

Figure 4 Market segment projections (2008, 2015 and 2020)



Source: FCAI (2010); Confidential consultation with car manufacturers/importers

Market segment assumptions

The market segment projection shown in Figure 4 are underpinned by the followings assumptions:

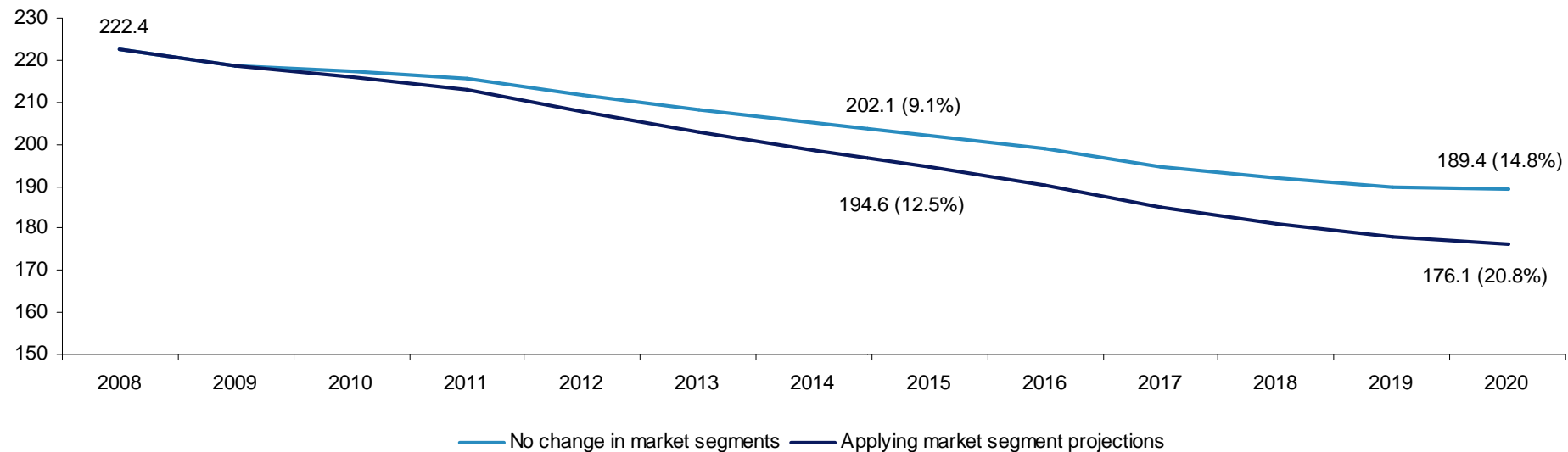
- Projections to 2015 are based on consultation with FCAI and vehicle manufacturers/importers,
- 2020 projections for Hybrids, LPG, diesel and EV are based on consultation with vehicle manufacturers/importers. 2020 projections for other segments are calculated assuming that the relative proportions do not change from 2015 projections,
- Market shares post 2020 assumed to remain at 2020 levels,
- Diesel is separated into passenger, SUV and LCV segments. Diesel (total) reaches 32% by 2020 (from 20.9% in 2008),
- Hybrids are separated into petrol passenger (125 g CO₂/km) and petrol SUV (145 g CO₂/km) segments. Hybrids (total) reach 3% by 2015 and 7% by 2020 (from 0.4% in 2008), and
- Electric vehicles reach 0.5% of the market by 2015 and 3% by 2020 (up from 0% in 2008).

Projected carbon emissions

As illustrated in Figure 5, carbon emissions are projected to decrease by 12.5% by 2015 (relative to 2008) and by 20.8% by 2020. The shift to diesel vehicles and improvements in diesel technology alone are estimated to result in a 5.8% improvement by 2015 and a 7.6% improvement by 2020.

- In 2015, average carbon emissions are projected to reduce to 202.1 g/km (assuming no change in market share) or 194.6 g/km (applying market share projections).
- The reduction is projected to be fairly smooth reflecting staggered product cycles for different models ranging from 3 to 10 years.
- There is significant commonality in the types of technologies being introduced by different manufacturers/importers.
- The ‘flattening’ of the trend line for carbon emissions reflects the fact that:
 - Technologies deliver diminishing marginal returns over time, and
 - Manufacturers and importers are generally reluctant to make projections beyond 2015 given new product cycles and uncertainty regarding technology options, consumer demand and government incentives/regulations.

Figure 5. Projected carbon emissions from the implementation of new vehicle technologies and changes in market segments (g CO₂/km)



Source: Confidential consultation with car manufacturers/importers

Projected carbon emissions

The results of the carbon emission projections are likely to suffer from optimism bias (i.e. manufacturers are likely to systematically overestimate technology uptake and achievable savings) and are sensitive to changes in the underlying assumptions. For example:

- A 50% reduction in the efficiency gains attributable to each technology (with no changes to the market segments) decreases the projected carbon emission reductions to 9.0% by 2015 and 15.1% by 2020,
- A 50% reduction in the proportion of hybrid vehicles decreases the estimated carbon emission reductions to 12.1% by 2015 and 20.0% by 2020,
- A 50% reduction in the proportion of electric vehicles decreases the estimated carbon emission reductions to 19.6% by 2020, and
- A simultaneous 50% reduction in technology improvements, the proportion of hybrid vehicles and the proportion of electric vehicles decreases the estimated carbon emission reductions to 8.5% by 2015 and 12.7% by 2020.

Reductions in 2020 emissions

- Applying current Australian Government 2020 emissions reductions policy commitments and comparing carbon emissions savings from new vehicles by 2020 against 2000 levels, projected emissions savings could be as high as 21%, assuming the kilometres driven remain constant. This estimate is calculated by multiplying estimated NACE in 2000 (extrapolated from the model projections) by vehicle sales and the projected 2020 NACE by projected vehicle sales. This estimated base case saving of up to 21% is at the upper end of the emissions reduction policy from the Australian Government and over four times the minimum CPRS target (assuming the kilometres driven remain constant).

Section 4

What are the options for a standard?

Options – Overview

Options for consideration

Consistent with the RIS requirements the following options have been considered:

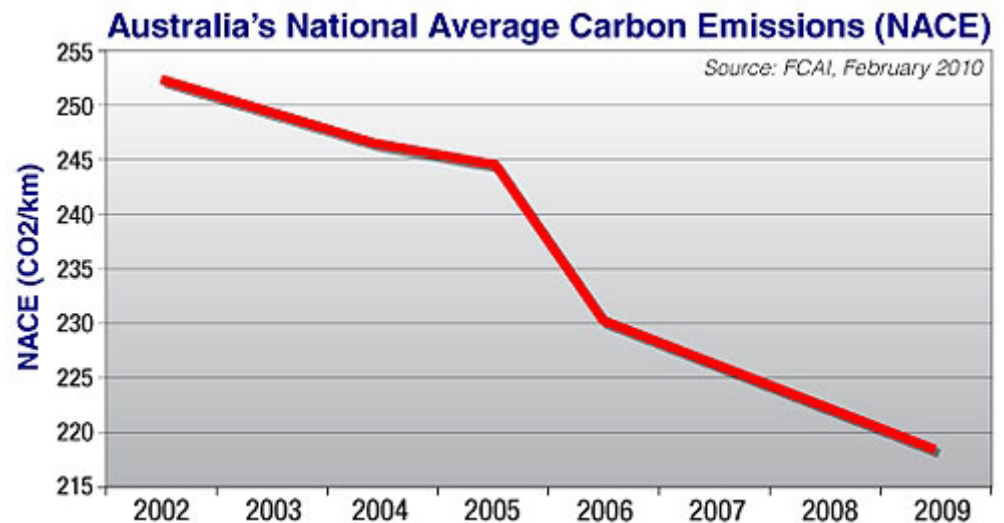
- **Option 1 – Business as usual.** Update the voluntary NACE target to reflect base case projections. This would involve the automotive industry unilaterally determining a single industry-wide self-enforced target
- **Option 2 – Jointly developed voluntary standard.** An alternative to the voluntary NACE target would be for the Australian Government to co-develop a new voluntary target with the automotive industry. Types of voluntary standards that have been considered during preparation of this report are:
 - Corporate average target,
 - Corporate average target segmented by mass or wheel base, and
 - Individual vehicle targets.
- Offsets could be made available to recognise emissions reductions benefits of low emissions vehicles. Similarly, recognition of safety initiatives is also important.
- All of these forms of voluntary standards could provide the opportunity for the automotive industry to continue to self regulate, through effective governance and enforcement structures. For example, through appointment of an expert panel.
- **Option 3 – New mandatory standard.** The Australian Government may decide to mandate a standard through new regulation. In effect, this approach takes the industry led option 2 and adds government control of the standard.

Option 1 – Update current voluntary NACE target

In March 2003, the FCAI adopted a voluntary target aimed at progressively improving fuel consumption for new petrol passenger vehicles to an average of 6.8 litres per 100 kilometres (l/100 km) by 2010. The FCAI established this target to demonstrate the continuing commitment by the automotive industry to improving environmental performance.

In 2005 the FCAI switched the unit of measurement to the NACE target and set a voluntary carbon target of 222g/km by 2010. Over recent years there has been a continuous reduction in average new vehicle emissions from an estimated 252 g CO₂/km in 2002 to 226.1 g CO₂/km in 2007. The 2010 target was reached in 2008 (with 222.4g/km) and the 2009 figure was 218.5g/km.

Figure 6 – Representation of emissions reductions from applying the NACE



Options – Criteria

Option 1 – Update current voluntary NACE target (cont.)

- Under this approach the FCAI would again establish a single voluntary target that the industry would strive achieve.
- The voluntary NACE target does not require any tax funded administration or incentives, and existing infrastructure is already in place for administration of the target. The voluntary NACE target provides each participating corporation with the flexibility to achieve the target in the most cost effective way.
- The business as usual modelling carried out for FCAI during preparation of this report demonstrates that business as usual for the automotive industry will continue to make a significant contribution to emissions reductions through projected introduction of low emissions technologies and market segment changes. However, there is no formal or informal penalty mechanism in the event that the target is not met.
- If the NACE target is not achieved for any reason, the Australian Government may respond with a mandatory standard that the automotive industry has not agreed to. This is a risk with the NACE target approach, and all corporations covered by the NACE target are subject to this risk, including those corporations with relatively low corporate average emissions.
- From a policy perspective, the challenge is to allocate accountability to individual vehicle types or manufacturers for their contribution to achievement of the voluntary NACE target. The design of the NACE target is currently such that if the target is not achieved, then all NACE participants are responsible for the consequences.

Option 2 – Jointly developed voluntary standard

Option 2 differs from Option 1 in that there is a collaborative approach between the FCAI and government to develop a new standard. Implicit in this approach is the view that such a standard must have a formal mechanism to deal with the event that the target is not met.

- **Industry target.** Akin to the existing single industry NACE target, this would be a single standard, but developed in conjunction with the Australian Government. This approach has the attraction of familiarity, but suffers from the perspective of enforcement. If the target is not met a penalty would have to be applied to industry participants.
- **Corporate average.** This is an approach that has been adopted in the EU and US, as well as some other jurisdictions. Automotive industry feedback is that a corporate average target will disadvantage some manufacturers and importers that sell larger vehicles. However, there are means of averaging and allowing offsets for new technologies and safety features that could overcome this issue. In addition, there is a prescribed way for corporations to collectively ‘pool’ to achieve such a target in the EU.
- **Corporate target for vehicles within mass ranges.** An alternative is for a mass based target to be developed, so that individual targets are set for each weight range. For example, vehicles within the mass range of x to y kilograms would be subject to a target. These mass “segments” could apply to diesel and petrol engines. Issues with with a target like this are:
 - There could be perverse outcomes at the margins of each segment, where vehicles are incentivised to add mass in order to move to a higher mass “segment” to obtain relief from a tighter target in the lower mass “segment”,
 - Although there appears to be a correlation between vehicle mass and emissions, industry feedback is that this relationship it is not always consistent, and
 - This approach would lead to a greater number of vehicle targets required.

Options – Criteria (continued)

Option 2 – Jointly developed voluntary standard (cont.)

- **Individual vehicle targets.** These are possible given that vehicle emissions data is collected under ADR 81/02, which provides criteria for recording of new vehicles and their mass. However, this form of target would be administratively complex, as each new make and model would need to be allocated a target
- **Trade-off.** The key trade-off in all schemes is one of simplicity (i.e. broader categories) and greater scope for averaging, with the inherent inefficiencies associated with the resultant cross-subsidies between manufacturers (i.e. a target that necessarily sits between higher and lower emitters).
- **Proposed flexibility in design:** The following design features could be used in a voluntary standard to ensure flexibility in design
 - **Averaging and offsetting.** A corporation is given the flexibility to offset emissions from sales of one vehicle with another particular vehicle type in a given year.
 - **Pooling.** A corporation that expects to exceed the allowable emissions from sales in a given year can agree with another corporation to “pool” so that they both achieve the target.
 - **Banking & borrowing.** Banking additional emissions savings against the target would be allowable for the duration of a new vehicle production cycle (allow 3 years, based on industry consultation). Borrowing forward against projected savings from sales of a new vehicle type would also be allowable (again, for a period of 3 years based on automotive industry feedback).
 - **Make good.** To ensure environmental integrity a voluntary standard could require corporations to be subject to an obligation to make good each year. This could be equivalent to the current carbon price (or Treasury estimate of the carbon price). A tiered approach could apply for exceedences, so that a higher make good obligation applies for significant emissions, to discourage continued sales of such vehicles in the market.
- **Use of revenue.** Revenue from penalties and administrative charges would subsidise the cost of scheme administration or be applied to incentivise emissions reduction. Incentive priorities would be determined in consultation with the new vehicle industry in Australia
- **Form of voluntary standard.** In relation to the form of co-developed standard, the following are possible:
 - Understanding between the automotive industry and Government (MOU),
 - Industry self regulation underpinned by MOU;
 - Corporation opt-in to a binding contract; and
 - Corporation opt-in to non-binding standards.
- All of these forms of documenting a voluntary standard could provide the opportunity for the automotive industry to continue to self regulate through effective governance and enforcement structures. For example, through appointment of an expert panel to oversee the standard.
- These forms of voluntary standard also enable the flexible design features to be applied.

Option 3 – Mandatory standard

The Australian Government may decide to mandate a standard through new regulation. In effect, a regulatory response could adopt any of the target approaches adopted earlier. Regulation has the benefit of clearer enforcement power and reduced ability for free-riding, (i.e. in the event that a voluntary mechanism cannot achieve close to universal coverage) but comes at the cost of less flexibility in responding to market developments and increased risk to participants.

Options – Criteria (cont)

Design features of a co-developed or mandatory standard

If Options 2 or 3 were to be adopted, we list the following observations with respect to design features that would assist with administrative simplicity:

- **Single industry wide target.** The industry is familiar with a single target number and manufacturers and importers currently collaborate through providing data to FCAI and regularly meeting to discuss the NACE and associated issues.
- **Unit of measure.** Consistent with the NACE, g CO₂ would be the most appropriate unit to measure.
- **Penalties.** Penalties should be applied on a per vehicle basis for an exceedance above the industry target. The penalty should be calculated by reference to a forecast carbon price (i.e. similar to an obligation to “make good” for exceedances under the CPRS and other mandatory measures). Appendix 2 contains forecasts that are reasonable for setting a penalty range.
- **Phase in.** A phase-in of vehicles covered by the standard over time would be appropriate to minimise the risk of a shock to industry and to allow consumers enough time to adjust to changes to vehicle ranges. Any standard needs to take into account the fact that a usual production cycle is at least 3 years, so this needs to be taken into account when a standard is being set.
- **Flexibility.** It would be simple and consistent with other international measures to allow:
 - **Offsets.** A corporation that exceeds the allowable target emissions from sales of one particular vehicle type in a given year should be able to offset that exceedance (i.e. g CO₂) through sales a low emissions vehicle. Similarly, offsets should be allowed for innovations such as safety initiatives, biofuels and other initiatives that are recognised as either lower emissions or that bring other recognised benefits, and
 - **Banking & borrowing.** Banking additional emissions savings against the target should be allowable for the duration of a production cycle (allow 3 years, based on industry consultation). Borrowing forward against projected savings from sales of a new vehicle type would also be allowable (again, for a period of 3 years based on industry feedback).
 - **Industry pooling.** Flexibility for corporations to collaborate and pool to achieve the target should be allowable and encouraged, which is consistent with other schemes and helps to achieve lowest economic cost of reductions.
- **Materiality test.** Certain vehicle types may be excluded from coverage (such as those covered under a specialist and enthusiast scheme).

Options – Summary of types of target and criteria assessment

Target type → Criteria ↓	Whole of industry target	Corporate Average Carbon Emissions target (CACE)	Corporate target segmented by criteria eg mass or wheel base	Individual vehicle target
Existing or new policy measure	Existing NACE, or new target if NACE is modified	New (either mandatory or voluntary)	New (either mandatory or voluntary)	New (either mandatory or voluntary)
Description	Pooled / shared target approach across the industry. NACE is currently in use as a voluntary industry standard	Target allocated to individual corporations that manufacture and/or import new vehicles. The US has adopted a form of CACE target.	Target imposed on segment of similar vehicles (eg small passenger between mass range X to y kg). Various options available in terms of mass segments or other segments such as wheel base.	Target imposed on individual vehicles that each manufacturer produces or imports
Target setting approach	Industry as a whole agrees to an emissions reduction against an industry baseline	Corporations commit to an individual target that is allocated based on their contribution to total industry emissions	Relies on correlation between segments and emissions so that corporations manufacturing similar vehicles have a consistent target. This correlation is not always present which increases the risk of perverse outcomes.	Targets for each vehicle type, based on historic data and production cycle
Administrative simplicity	There is no new regulation required for a voluntary target. However, there is no individual entity held accountable for the target, which present a problem if the target is not achieved.	Target setting will need to include differential targets to incentivise behaviour. Corporations that are historically low emitters (below industry average) would could arguably require a smaller reduction target than high emitters (i.e. above industry average) so there is some complexity in target setting	Complexity in defining segments and assigning vehicles to them. Complexities with vehicles at the margins of each segment as manufacturers are incentivised to modify vehicles to avoid segment impacts	Complexity associated with administering the target at an individual vehicle level, particularly as frequent updates will be required with changes to models
Flexibility options	Provides complete flexibility, although there is no clear target for individual corporations	Full flexibility for corporation as to how it achieves target, including options to pool with other manufacturers	Flexibility for corporation to achieve target within segment by offsetting with more efficient vehicles or pooling with other manufacturers	Very limited flexibility as corporation's must achieve individual vehicle target (ie difficult to pool)
Enforcement options	The NACE has no enforcement, with significant risk of free rider by those manufacturers above the industry baseline	Corporations are subject to penalties if they do not meet the single target	Corporations are subject to targets according to the range of segments covered by their fleet	Corporations are subject to individual vehicle targets
Summary	A simple measure, but lacking ease of enforcement	Administratively simple once a target setting methodology is agreed. The US and other jurisdictions have adopted a form of CACE target	Although this type of target has merit, it is complex and difficult to administer	Complex to administer due to large number of vehicles and variations between vehicles

Proposed design of a standard for new vehicle carbon emissions

- **Target setting approach.** To be consistent with Australia’s emissions reductions policy of 5% - 25% of 2000 levels by 2020 and targets in other jurisdictions, the target will need to be aspirational. The base case identified in this report can be considered aspirational for target setting, particularly where companies within the automotive industry have provided us with sales projections. Forecast sales projections often need to be adjusted (down) to allow for optimism bias.
- **Who does it apply to?** The proposed standard would bind corporations that supply vehicles into the Australian market (i.e. Australian manufacturers and importers), because they have the greatest level of control over vehicle types introduced to Australia and are the simplest to administer. It will be desirable to utilise the infrastructure already in place, such as the process for recording individual new vehicle emissions under ADR 81/02 and the industry adopted NACE target.
- **Type of target.** Having reviewed the options and criteria presented on page 26, we recommend that FCAI further investigate a percentage reduction commitment in the form of a CACE target because:
 - A CACE target is simpler than segment or individual vehicle targets, as there will only be one target set per corporation based on historical emissions and the base case; and
 - A CACE target provides the corporation with the greatest degree of flexibility as to how it will achieve the reduction target.
- **What does a CACE target cover?** Under a mandatory CACE target standard, each corporation would be required to comply annual published target, being the maximum carbon emissions allowable for all new vehicles sold by that corporation. That target will be set according to historic emissions and phased in according to emissions intensity above the industry baseline.
- **Materiality test.** Certain vehicle types may be excluded from coverage (such as those covered under a specialist and enthusiast scheme).
- **Proposed flexibility in design:**
 - **Pooling.** A corporation that expects to exceed the allowable emissions from sales in a given year, can agree with another corporation to pool emissions rather than pay a penalty.
 - **Banking & borrowing.** Banking additional emissions savings against the target would be allowable for the duration of a production cycle (allow 3 years, based on industry consultation). Borrowing forward against projected savings from sales of a new vehicle type would also be allowable (again, for a period of 3 years based on industry feedback).
 - **Recognition of eco-technologies.** From consultation during preparation of this report, we understand that some technologies are not assessed through the vehicle test procedures under ADR 81/02, such as advanced air-conditioning gases, which can reduce new vehicle carbon emissions. Flexibility should be considered to lessen the CACE target obligation for new vehicles to take this reduction into account. There are a number of available methodologies to measure the reductions achieved against an industry baseline.
- **Penalties.** Penalties should be applied on a per vehicle basis for an exceedance above the industry target. The penalty should be calculated by reference to a forecast carbon price so that the penalty is applied in terms of \$ per gram of CO2 per vehicle (i.e. similar to an obligation to “*make good*” for exceedances under the CPRS and other mandatory measures). Appendix 2 contains forecasts that contain reasonable assumptions for setting a penalty range.
- **Use of revenue.** Revenue from penalties and administrative charges would subsidise the costs of scheme administration or be applied to incentivise emissions reduction. Incentive priorities would be determined in consultation with the new vehicle industry in Australia.
- **Phase in.** A phase-in of vehicles covered by the standard over time would be appropriate to minimise the risk of a shock to industry and to allow consumers enough time to adjust to changes to vehicle ranges. Any standard needs to take into account the fact that a usual production cycle is at least 3 years, so this needs to be taken into account when a standard is being set.

Appendix 1

Extract from National Strategy on Energy
Efficiency

Table 2.3 taken from National Strategy on Energy Efficiency (endorsed by COAG on 2 July 2009)

Measure	Key elements	Indicative pathway	Implementation responsibility
2.3.1 Develop a package of measures to improve the fuel efficiency of the Australian vehicle fleet.	<ul style="list-style-type: none"> a. Assess the costs and benefits of introducing Co₂ emission standards for light vehicles. b. Co-ordinate on-line information to assist fleet managers. c. Include fuel consumption and Co₂ data in vehicle advertising, d. Develop and deploy the 'Truck Buyers Guide' on the Green Vehicle Guide website. e. Co-ordinate on-line information for low-emission technologies for commercial vehicle operators. 	<p>Undertake a detailed regulatory impact analysis for introducing Co₂ emission standards for light vehicles.</p> <p>Co-ordinate the development and dissemination of on-line resources, drawing on best practice frameworks and case studies, to assist fleet managers in incorporating objective environmental criteria into fleet purchasing decisions.</p> <p>Develop a code of practice regarding the inclusion of fuel consumption and CO₂ data in vehicle advertisements and promotional materials. If a code of practice is not achieved, pursue the development of mandatory provisions.</p> <p>Co-ordinate the development of on-line information resources regarding trials and evaluations of low emission technologies for commercial vehicles to assist operators in assessing the effectiveness of various technologies.</p>	<p>Australian Transport Council to monitor and report progress on the measures to COAG and develop implementation plans for each measure by the end of 2009.</p> <p>Responsibility for implementation of key elements is as follows:</p> <ul style="list-style-type: none"> a. Australian Government <ul style="list-style-type: none"> • Department of Infrastructure, Transport, Regional Development and Local Government (DITRD LG) b. Australian Government <ul style="list-style-type: none"> • DITRD LG, in conjunction with the States and Territories and other stakeholders c. Australian Government <ul style="list-style-type: none"> • DITROIG d. Australian Government <ul style="list-style-type: none"> • DITROIG <p>Victorian Government</p> <ul style="list-style-type: none"> • Department of Sustainability and Environment <p>NSW Government</p> <ul style="list-style-type: none"> • Department of Environment and climate change e. Australian Government <ul style="list-style-type: none"> • DITRD LG <p>NSW Government</p> <ul style="list-style-type: none"> • Roads and Traffic Authority, in conjunction with other interested jurisdictions and industry stakeholders

Table 2.3 taken from National Strategy on Energy Efficiency (endorsed by COAG on 2 July 2009)

Measure	Key elements	Indicative pathway	Implementation responsibility
2.3.2 Encourage the domestic car manufacturing industry to develop and build more efficient passenger motor vehicles.	<p>a. The Australian Government's \$6.2 billion A New Car plan for a Greener Future is designed to encourage innovative Industry responses to market challenges, particularly investment in environmentally-friendly automotive technologies.</p> <p>b. In particular, the \$1.3 billion Green Car Innovation Fund will provide assistance over ten years to design, develop and manufacture low-emission, fuel-efficient cars and components in Australia.</p>	<p>The Green Car Innovation Fund was launched on 24 April 2009 with a public call for applications.</p> <p>The Fund is a competitive merits based program administered by AusIndustry. Payments will commence from 1 July 2009.</p> <p>Measure 2.3.1 addresses further initiatives to improve the fuel efficiency of the vehicle fleet.</p>	<p>Australian Government</p> <ul style="list-style-type: none"> Department of Innovation, Industry, Science and Research <p>As Per measure 2.3.1</p>
2.3.3 Introduce voluntary measures to improve the performance of heavy vehicle fleets.	<p>a. Pilot a SmartWay-style voluntary emissions reduction program involving the freight industry,</p> <p>b. Establish networks or organisations that give priority to accredited smartway carriers and working with heavy vehicle fleet operators to encourage them to implement innovative fuel and emissions savings devices on their vehicles (such as improved vehicle aerodynamics, idle-off devices, low roll resistant tyres, or driver training).</p>	<p>Actual program design would be developed based on an assessment of which options are most suitable for the Australian heavy road transport sector and developed in consultation with transport industry stakeholders.</p>	<p>NSW and Victorian Governments</p>

Table 2.3 taken from National Strategy on Energy Efficiency (endorsed by COAG on 2 July 2009)

Measure	Key elements	Indicative pathway	Implementation responsibility
2.3.4 Introduce voluntary measures to improve the performance of passenger vehicle fleets,	<ul style="list-style-type: none"> Benchmarking the environmental performance of existing fleets, and utilise an on-line tool to inform fleet managers of opportunities to improve performance through purchasing and operational practices for the fleet. The measure would be voluntary – fleet managers choose to participate and organisations can benefit from improved environmental performance and reduced costs. 	<p>The framework for the measure has already been undertaken by NSW. The FleetWise tool could be rolled on a national basis and on a voluntary basis by participating jurisdictions.</p>	NSW in conjunction with participating jurisdictions.
2.3.5 Develop an effective Australian eco-driving program.	<ul style="list-style-type: none"> Develop evidence-based eco-driving training methodologies to inform the establishment of eco-driving programs in Australia. 	<p>Victoria and South Australia are jointly undertaking eco-driving trials, and along with other jurisdictions are planning a national workshop on eco-driving to be held in October 2009. Western Australia has undertaken a pilot program with heavy vehicles to reduce idling while vehicles are stationary. Victoria has also committed, as part of the Victorian Transport Plan, to develop an eco-driving campaign to help motorists reduce their fuel consumption. This campaign will be based on the findings of the VIC/SA eco-driving trial.</p>	<p>Australian Transport Council</p> <ul style="list-style-type: none"> Environment Standing sub-committee

Appendix 2

Treasury modelling

Forecast pricing based on Treasury modelling

(Reference: Treasury report – *Australia's Low Pollution Future, The Economics of Climate Change Mitigation*, dated 30 October 2008)

Table 6.1: Mitigation scenarios

	CPRS – 5	CPRS – 15	Garnaut – 10	Garnaut – 25
Emission stabilisation goal (CO ₂ -e ppm)				
	550	510	550	450
Emission target (per cent change from 2000 levels)				
2020	-5	-15	-10	-25
2050	-60	-60	-80	-90
Australian permit price (CO ₂ -e)				
Start of scheme (\$nominal)	23	32	30	52
2020 (\$2005 prices)	35	50	35	60
2050 (\$2005 prices)	115	158	114	197

Note:

(1) This table contains estimates of carbon price based on alternative policy scenarios. Such estimates would be reasonable to use to set assumptions around any penalty introduced as part of a mandatory or voluntary scheme.

(2) The CPRS scenarios start in 2010. The Garnaut scenarios start in 2013. The CPRS -5 price is A\$30 in 2013, the same as the Garnaut -10 scenario.

Source: Treasury estimates from MMRF.

Appendix 3

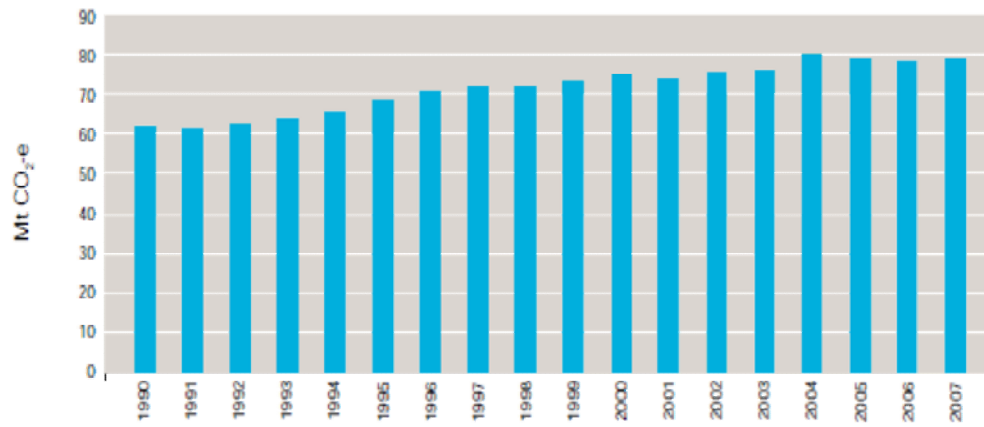
National Greenhouse Gas Inventory Data

National Greenhouse Gas Inventory (extract from May 2009 NGGI)

Transport

In 2007 Transport contributed 78.8 Mt CO₂-e or 14.6 per cent of Australia's national inventory⁴ emissions. Transport emissions are one of the strongest sources of emissions growth in Australia. Emissions from this sector were 26.9 per cent higher in 2007 than in 1990, and have increased by about 1.5 per cent annually on average (Figure 6). Between 2006 and 2007, transport emissions increased by 0.2 per cent. Preliminary estimates for 2008 indicate that transport emissions have increased by 2.2 per cent (1.7 Mt) since 2007.

Figure 6: Total transport emissions, 1990 – 2007



³The national inventory account for emissions from electricity at the point where the emissions occur, which means the power station where electricity is produced, not the point where the electricity is used. Therefore, emissions associated with electricity used in the industry, residential and commercial sectors are included under energy production. For information on the allocation of emissions from electricity to end uses, see National inventory by Economic Sector 2007.

⁴The national inventory, before accounting for Land Use, Land Use Change and Forestry activities, financial year data.

Road transport

Road transport was the main source of transport emissions and accounted for 87 per cent (68.5 Mt) of 2007 transport emissions. Emissions from road transport increased by 26.1 per cent (14.2 Mt) between 1990 and 2007.

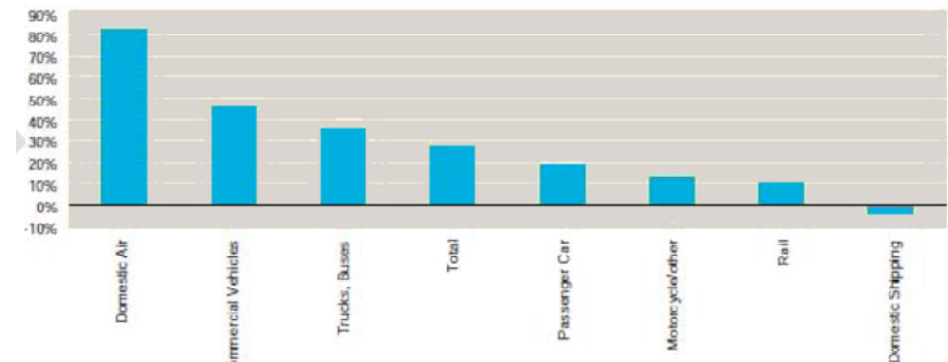
Passenger cars were the largest transport source contributing 41.9 Mt. emissions from passenger cars increased by 18.8 per cent (6.6 Mt) between 1990 and 2007. Emissions from Light Commercial Vehicles (LCVs) and truck have grown strongly.

Other modes of transport

Other transport sources are smaller contribution to total transport emissions: – civil aviation contributed 6.8 per cent (5.3 Mt), domestic shipping 3.7 per cent (2.9 Mt), and railways 2.5 per cent (1.9 Mt).

Domestic air transport emissions were 82.8 per cent (2.4 Mt) higher than the 1990 level. Emissions have grown strongly in this sector, particularly in the early 1990s, although emissions in 1990 were unusually low because of extensive airline disruptions in that year and this has contributed to the magnitude of the change. Emissions from rail have risen by 10.7 per cent while domestic shipping emissions have fallen by 4.2 per cent, reflecting improved productivity and changes in activity (Figure 7).

Figure 7: Comparison of growth in transport emissions by subcategory, 1990 – 2007



Appendix 4

New Vehicles Carbon emissions and reduction targets – other countries

New Vehicles Carbon emissions standards – Other countries

Note: This table presents examples of new vehicle measures for passenger, SUVs and light commercial vehicles in other jurisdictions, highlighting some of the differences in approach between the jurisdictions

EU	USA	Japan
<p>Current (refer http://ec.europa.eu/environment/air/transport/co2/co2_home.htm) Limit value curve: the fleet average to be achieved by all cars registered in the EU is 130 grams per kilometre (g/km). A so-called limit value curve implies that heavier cars are allowed higher emissions than lighter cars while preserving the overall fleet average.</p> <p>Penalties: Lower penalty payments for small excess emissions until 2018: If the average CO2 emissions of a manufacturer's fleet exceed its limit value in any year from 2012, the manufacturer has to pay an excess emissions premium for each car registered. This premium amounts to €5 for the first g/km of exceedance, €15 for the second g/km, €25 for the third g/km, and €95 for each subsequent g/km. From 2019 the first g/km of exceedance will cost €95.</p>	<p>Current: 27.5 mpg ("in MY 1990, the passenger car standard was amended to 27.5 mpg, which it has remained at this level." (see http://www.nhtsa.dot.gov/CARS/rules/CAFE/overview.htm)</p> <p>Penalties: \$5.50 USD per tenth of a mile per gallon for each tenth under the target value times the total volume of those vehicles manufactured for a given model year.</p>	<p>Current: 6.68L/100km (petrol cars) 6.13L/100km (petrol light medium-duty trucks) 8.62L/100km (diesel cars) 6.80L/100km (diesel light medium duty trucks) (see http://www.dieselnet.com/standards/jp/fe.php)</p> <p>Penalties: Process for applying penalty includes admonition, public announcement, edict and issuing financial penalty.</p>
<p>Phase in: Phasing-in of requirements: in 2012, 65% of each manufacturer's newly registered cars must comply on average with the limit value curve set by the legislation. This will rise to 75% in 2013, 80% in 2014, and 100% from 2015 onwards.</p>	<p>2012: Passenger cars: 261(g/mi) by 2012 Light trucks: 352 (g/mi) by 2012</p>	<p>2015: Passenger cars (under 2.5 tonne) 16.8 km/L by 2015 Small buses 8.9 km/L by 2015 Small freight 15.2 km/L by 2015</p>
<p>2020 target: Passenger cars: Avg 95g/km by 2020 Light commercial vehicles: Avg 135g/km by 2020 Overall objective for new car fleet: Avg 120g/km</p>	<p>2016: Passenger cars: 224(g/mi) by 2016 Light trucks: 302 (g/mi) by 2016</p>	

Carbon reduction commitments – Other countries

Note: These carbon reduction commitments demonstrate the variation between carbon commitments in each jurisdiction

EU	USA	Japan	Australia
Middle term target: 20% of 1990 levels by 2020	Middle term target: 17% below 2005 levels by 2020	Middle term target: Middle: 25% of 1990 levels by 2020	Middle term target: 5% to 25% of 2000 levels by 2020
Long term target: 60-80% of 1990 levels by 2050	Long term target: 83% below 2005 levels by 2050		Long term target: 60% of 2000 levels by 2050 (as stated in CPRS White Paper <i>Australia's Low Pollution Future</i>)

Appendix 5

Information sources

Information sources

(in addition to industry consultation)

- AECOM report for NSW Government 2009, entitled *Economic Viability of Electric Vehicles*
- ATC and EPHC (Australian Transport Commission and Environment and Protection Heritage Council) 2009, *Vehicle Efficiency Working Group – Final Report*
- Council of Australian Governments 2009a, *National Strategy on Energy Efficiency*
- Council of Australian Governments 2009b, *Communique*, 2 July
- European Commission 2008 SEC (2007) 1723 *Proposal for a Regulation to reduce CO2 emissions from light duty vehicles – Impact Assessment*
- CRC for Advanced Automotive Technologies 2009, *Technologies for Sustainable Vehicles*
- Jamison Group reports to NRMA Motoring & Services, February 2010 *Fuelling Future Passenger Vehicle Use in Australia*
- King Review Report for the UK Government, *Part 1: The potential for CO2 reduction dated October 2007 and Part 2: recommendations for action dated March 2008*
- PricewaterhouseCoopers 2007 *The automotive industry and climate change, Framework and dynamics*
- *Vehicle Standard (Australian Design Rule 81/02 – Fuel Consumption Labelling for Light Vehicles)* 2008
- Wilkins Report for the Australian Government 2008 *Strategic Review of Australian Government climate change Programs.*

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