
Submission to the House
Economics Committee

*Inquiry into
Australia's Oil Refinery Industry*



Federal Chamber of Automotive Industries
Level 1, 59 Wentworth Avenue
KINGSTON ACT 2604
Phone: +61 2 6229 8214
Facsimile: +61 2 6248 7673

Contact: Mr James Hurnall

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EXECUTIVE SUMMARY

The Federal Chamber of Automotive Industries (FCAI) is the peak industry organisation representing vehicle manufacturers and importers of passenger vehicles, light commercial vehicles and motorcycles in Australia.

Reducing the environmental impact of motor vehicles, including reducing CO₂, is a key design input for all manufacturers as part of providing a quality product that meets the expectations of customers.

In the lead up to the 2010 federal election, the Prime Minister announced that CO₂ emissions standards would be mandated. The Government is currently developing the Regulatory Impact Statement (RIS) to introduce mandatory CO₂ targets, as a complementary measure to the Government's Clean Energy Future Plan. The industry supports this approach as it provides the certainty needed in this important policy area to plan for product development and deployment in a practical timeframe.

The Government has also introduced the European (Euro 5 and Euro 6) vehicle air pollutant emission standards (effective from 1 November 2013) as the latest in a series of air pollutant emission standards.

Vehicles are designed and developed to meet CO₂ targets and/or air pollutant emission standards with an expectation of fuel quality in a particular market. While air pollution emission standards have been introduced into Australian legislation and CO₂ targets are being considered, the Government has not introduced the concomitant fuel quality standards.

The FCAI and member companies consider that a whole of Government approach is required to incorporate all associated issues, including fuel quality standards, which have a significant impact on vehicles' ability to meet both CO₂ targets and air pollution emission standards.

If appropriate market fuel quality is not available, higher exhaust emissions (both CO₂ and pollutants) will be generated with lower than expected improvements to air quality and health outcomes. Vehicle operability and durability issues will also be experienced such as:

- Reduced time between regeneration of NO_x catalysts leading to increased fuel consumption and reduced catalyst life
- Early activation of malfunction indicator warning lamps (MIL)
- Increased operating and servicing costs.

The potential for degraded performance, operability and durability of some vehicle technologies due to low quality market fuel could lead to reputational damage if the vehicle does not operate as expected. To protect against such damage, some brands may instead choose to restrict from Australia the introduction of new technologies that require higher fuel standards.

1.0 INTRODUCTION

The Federal Chamber of Automotive Industries (FCAI) is the peak industry organisation representing vehicle manufacturers and importers of passenger vehicles, light commercial vehicles and motorcycles in Australia.

Reducing the environmental impact of motor vehicles, including reducing CO₂, is a key design input for all manufacturers as part of providing a quality product that meets the expectations of customers.

Vehicles are developed to meet vehicle emission standards with an expectation of fuel quality in a particular market. During the design and durability phases of new model development, the local market fuel parameters need to be specifically considered to ensure the vehicle operates to the expectations of both the owner and manufacturer, as well as meeting regulated CO₂ targets and pollutant emission standards.

If appropriate market fuel quality is not available greater exhaust emissions (both CO₂ and pollutants) will be generated, resulting in lower than expected improvements to air quality and health outcomes. Vehicle owners may also experience operability and durability issues such as:

- Reduced time between regeneration of NOx catalysts leading to increased fuel consumption and reduced catalyst life
- Early activation of malfunction indicator warning lamps (MIL)
- Increased operating and servicing costs.

The potential for degraded performance, operability and durability of some vehicle technologies due to low quality market fuel as described above could lead to reputational damage if the vehicle did not operate as expected. To protect against such damage, some brands may choose instead to restrict from Australia the introduction of new technologies that require higher fuel standards.

The FCAI and member companies considers that a whole of Government approach is required to incorporate all associated issues, including fuel quality standards, which have a significant impact on vehicles' ability to meet both CO₂ targets and air pollution emission standards.

2.0 OVERVIEW OF THE AUSTRALIAN AUTOMOTIVE INDUSTRY

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

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

The Australian automotive sector exported around \$3.3 billion in vehicles and components in 2011 and its annual turnover exceeds \$160 billion. At present, the industry directly employs almost 52,000 people through Australia's three vehicle manufacturers, dozens of importers and thousands of related component manufacturers. Further, the automotive industry employs nearly 280,000 people directly and indirectly throughout Australia. Around \$470,000 worth of product is generated per employee, which is a significant contribution to the Australian economy. The industry paid around \$3 billion in wages and salaries in 2009/10 and annually invests around \$700 million on research and development¹.

As tariff barriers on automotive products have reduced from 57.5% in the 1980s to effectively between 3 and 4% today, the number of vehicle brands and models in the Australian market has increased.

There are now over 60 brands in the Australian market, with just over one million new vehicle sales per year, equating to an average of 15,757 new vehicles sold per brand each year. This makes Australia one of the most competitive automotive markets in the world, illustrated by the following table which compares the competitiveness of key global markets. Double the numbers of new vehicles are sold per brand in Canada, almost three times as many in the UK and more than 230,000 new vehicles are sold per brand in the USA.

Table 2.1 Competitiveness of Global Vehicle Markets²

	Australia	Canada	UK	USA
No. of brands in market	64	48	54	51
Sales	1,008,437	1,583,388	2,293,576	11,772,220
Market size per brand	15,757	32,987	42,474	230,828

It has become much easier to afford a new car since the mid-1990s, as earnings growth has exceeded the movement in motor vehicles prices.

¹ Australian Government, Department of Innovation, Industry, Science, Research and Tertiary Education (DIISRTE), 2011, Key Automotive Statistics 2011.

² Australian Government, Department of Innovation, Industry, Science, Research and Tertiary Education (DIISRTE), 2012, Automotive Industry Data Card, July 2012 Automotive Update.

Motor vehicles are also more technologically advanced today than ever before. Advanced security, safety and environmental features have been introduced in response to increasingly strict environmental regulations and growing demands from consumers.

3.0 VEHICLE EMISSION AND FUEL QUALITY STANDARDS

Vehicles are developed to meet vehicle emission standards with an expectation of fuel quality in a particular market. During the design and durability phases of new model development, the local market fuel parameters need to be specifically considered to ensure the vehicle operates to the expectations of both the owner and manufacturer as well as meeting any regulated CO₂ targets and pollutant emission standards.

Australian Design Rules (ADRs), the regulatory standards for vehicles in Australia, are harmonised with the international UN-ECE Regulations. The ADRs includes the standards and test cycles used to measure CO₂ emissions and air pollutant emissions from vehicles. Harmonisation with the leading international standards provides low barriers to entry for vehicle brands and assists with creating a highly competitive vehicle industry and delivering consumer benefits.

3.1 CO₂ TARGETS

Following the industry's agreement to the introduction of mandatory CO₂ targets for light vehicles, the Prime Minister announced during the lead up to the 2010 federal election that the starting point for negotiations would be an industry average of 190 gCO₂/km in 2015 and 155 gCO₂/km in 2024. These targets equate to reductions in CO₂ emissions of 14% and 30% by 2015 and 2024 respectively from 2008 levels.

The Australian Government is currently developing a Regulatory Impact Statement to introduce mandatory CO₂ targets³ for light vehicles as part of the Government's Clean Energy Future Plan:

"In July 2011, the Government announced its Clean Energy Future plan to reduce CO₂ emissions across all sectors of the Australian economy. The Government will achieve this through introducing a carbon price into the Australian economy and through implementing a range of complementary measures."

In a recent submission⁴ to the Department of Infrastructure and Transport (DoIT), the FCAI noted that as CO₂ emission standards are a complementary measure to the Clean Energy Future Plan, a whole of Government approach is required to incorporate all associated issues, including fuel quality standards, which have an impact on CO₂ emissions.

³ Australian Government, Department of Infrastructure and Transport, Light vehicle CO₂ emission standards for Australia, Key Issues - Discussion Paper 2011.

⁴ FCAI Submission to the Department of Infrastructure and Transport in response to the Discussion Paper on a new approach to comparing the environmental performance of vehicles on the Green Vehicle Guide.

3.2 AIR POLLUTANT EMISSIONS

The Australian Government has introduced the European (Euro) vehicle emission standards as Australian Design Rule (ADR) 79/03, ADR 79/04 and ADR 79/05. The timetable for implementation of the standards is outlined in Table 3.1 (below).

Table 3.1 Introduction timing of Euro 5 and Euro 6 Emission Standards

Emission Standard		Light petrol, LPG and NG vehicles		Light diesel vehicles	
		New models	All models	New models	All models
Euro 5 (stage 1)	ADR 79/03	1/11/13		1/11/13	
Euro 5 (stage 2)	ADR 79/04		1/11/16		1/11/16
Euro 6	ADR 79/05	1/7/17	1/7/18	1/7/17	1/7/18

The introduction of Euro 5 and Euro 6 are the latest in a series of air pollutant emission standards that have been introduced by the Government. Table 3.2 summarises the pollutant emissions standards that have been introduced since 2003 along with the limit values for the measured pollutants.

These are very complex standards, and include a requirement to demonstrate that the vehicle will continue to comply for a prescribed operating life of 160,000km.

The fuel required in the tests to certify a vehicle to the Euro 5 and Euro 6 air pollutant emission standards is 95 RON 10 ppm sulphur petrol. This is a higher standard than the fuel available in the Australian retail fuel market (see Section 3.3).

Table 3.2 – Summary of Emission Standards⁵

Emission Standard	Introduction timing ⁶	Limit Values (g/km)								
		CO		THC		NOx		THC+NOx		PM
		Petrol	Diesel	Petrol	Diesel	Petrol	Diesel	Petrol	Diesel	Diesel
Euro 2 (ADR 79/00)	2003	2.2	1.0	-	-	-	-	0.5	0.7	0.08
Euro 3 (ADR 79/01)	2005	2.3	0.64	0.20	-	0.15	0.50	-	0.56	0.05
Euro 4 (ADR 79/02)	2008	1.0	0.50	0.10	-	0.08	0.25	-	0.30	0.025
Euro 5 (ADR 79/03)	2013	1.0	0.50	0.10 (0.068)	-	0.06	0.18	-	0.23	0.0045
Euro 6 (ADR 79/05)	2017	1.0	0.50	0.10 (0.068)	-	0.06	0.08	-	0.17	0.0045

3.3 FUEL QUALITY STANDARDS

Australia is a relatively small market for most automotive brands, and has a market fuel standard that is of lower quality than the certification fuel for the regulated CO₂ targets and pollutant emission standards.

The Australian Design Rules are harmonised with the UN-ECE Regulations, and more than 80% of vehicles sold in Australia are imported (Section 3). Consequently, harmonisation of Australian fuel quality standards with the World Wide Fuel Charter⁷ (WWFC) and/or

⁵ Extract from “Emission Limits for Light Vehicles (3.5 tonnes GVM) under Un Regulation 83/.. at Euro 2, 3, 4 5 & 6 levels,” www.infrastructure.gov.au [downloaded 5 Nov 2012]

⁶ Introduction timing for ‘new models’ for petrol light vehicles as indicative timing. Full introduction timing is;

Light Petrol, LPG and NG Vehicles;

- Euro 2 adopted in ADR79/00 from 1/1/03 to 1/1/04
- Euro 3 adopted in ADR79/01 from 1/1/05 to 1/1/06
- Euro 4 adopted in ADR79/02 from 1/7/08 to 1/7/10
- Euro 5 adopted in ADR79/03 (Core Euro 5) from 1/11/13 and ADR79/04 (Full Euro 5) from 1/11/16
- Euro 6 to be adopted in ADR79/05 from 1/7/17 to 1/7/18

Light Diesel Vehicles

- Euro 2 adopted in ADR79/00 from 1/1/02 to 1/1/03
- Euro 3 (never formally adopted)
- Euro 4 adopted in ADR79/016 from 1/1/06 to 1/1/07
- Euro 5 adopted in ADR79/03 (Core Euro 5) from 1/11/13 and ADR79/04 (Full Euro 5) from 1/11/16
- Euro 6 to be adopted in ADR79/05 from 1/7/17 to 1/7/18

⁷ World Wide Fuel Charter, Fourth Edition, September 2006.

European fuel standards is necessary to achieve the improvement in fuel consumption and reduction in pollutant emission outcomes that the Australian Government aims to achieve with CO₂ targets and the introduction of Euro 5 and Euro 6 vehicle emission standards.

The WWFC represents the best collective assessment of fuel quality required for vehicle engines to operate as designed. The data contained in the documents are based on the experience of all major vehicle and engine manufacturers and is intended to promote understanding of the fuel quality needs of motor vehicle technologies. Importantly, the WWFC matches fuel specifications to the needs of engines and emission technologies designed for various major markets.

As Australia currently has Euro 4 as the minimum regulatory vehicle emission standard and Euro 5 will become the minimum emission standard in 2013, the FCAI considers that Australia is a Category 4 country under the WWFC:

“Markets with further advanced requirements for emission control to enable sophisticated NO_x and particulate matter after-treatment technologies. For example, markets requiring... EURO 4, EURO 5 Heavy Duty, or equivalent emission standards.”

Table 3.3 – Differences in Petrol Parameters

Parameter	WWFC – Cat 4	EU Fuel Standard	Australian Fuel Standard
Sulphur content	10 ppm (max) all grades	10.0 ppm (from 1 Jan 09)	150 ppm (max) ULP 50 ppm (max) PULP
Olefins	10.0% (max) v/v	18% (max) by volume	18% (max) by volume
Aromatics	35.0% (max) v/v	35.0% (max) v/v	42% pool average over 6 months with a cap of 45%
Research Octane Number		95.0 (min)	91.0 (min) ULP 95.0 (min) PULP
Motor Octane Number	82.5 (min) '91 RON'	85.0 (min) '95 RON'	81.0 (min) ULP 85.0 (min) PULP

However, the Australian fuel quality standard is of a lower standard than that recommended by the WWFC for Category 4 fuels and also the European fuel standard⁸.

The main differences between the current Australian fuel quality standard, the WWFC Category 4 fuel standard and the EU market fuels for petrol and diesel are outlined in Tables 3.3 (above) and 3.4 (following).

⁸ Delphi, 2010/2011, Worldwide Emission Standards

Table 3.4 – Differences in Diesel Parameters

Parameter	WWFC – Cat 4	EU Fuel Standard	Australian Fuel Standard
Cetane Index	55.0 (min) (52.0 min when cetane improvers are used)		46 (min)
Cetane Number	55.0 (min)	51 (min)	
Derived Cetane Number (of diesel containing biodiesel)	Meet the relevant WWFC limit.		51.0 (min)
Density	820 kg/m ³ (min)	820 (min) to 845 (max) kg/m ³	820 (min) to 850 (max) kg/m ³
Distillation T95	340°C (max) (or 320°C at T90)	360°C (max)	360°C (max)
Polyaromatic hydrocarbons (PAHs)	2.0% (max) m/m	11% (max) m/m	11% (max) m/m
Flash point	55°C (min)		61.5°C (min)

Tables 3.3 and 3.4 show that the two main areas where Australian fuel quality standards differ from the WWFC Category 4 fuels and also the EU market fuel are:

- Sulphur levels in petrol, and
- Cetane index/number in diesel.

Sulphur in Petrol

Sulphur is a significant contributor to vehicle emissions through reducing the efficiency of catalysts. Reductions in sulphur provide immediate reductions of emissions from catalyst-equipped vehicles on the road. For example, a US study found significant reductions in HC emissions when sulphur is reduced from around 100 ppm to 'low' sulphur fuel (see Figure 3.1 below)⁹. The US standards¹⁰ for sulphur in petrol are:

- Range of 15-80 ppm, (with 30 ppm average)
- California Air Resources Board has a tighter range of 30-40 ppm.

⁹ World Wide Fuel Charter, 4th Edn, Technical Background for Harmonised Fuel Recommendations

¹⁰ Delphi, 2010/2011, Worldwide Emission Standards

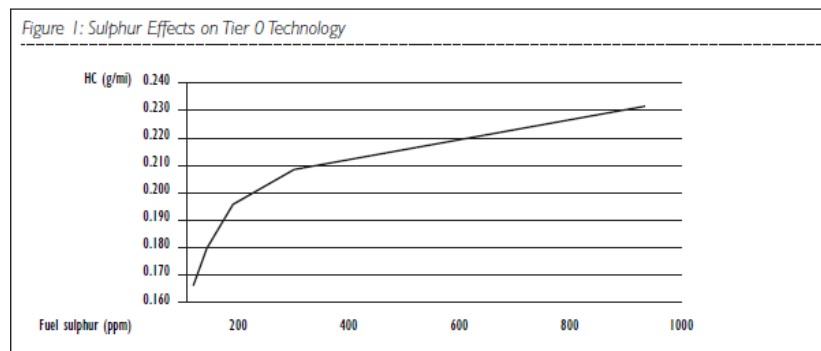


Figure 3.1 - Sulphur Effects on HC Emissions

Cetane in Diesel Fuel

Cetane is a measure of the compression ignition behaviour of diesel fuel and influences both NO_x emissions and fuel consumption. Tests conducted as part of the European Auto-Oil I program¹¹ showed:

- Reductions of up to 9% of NO_x in heavy duty engines
- An increase in Cetane Number from 50 to 58 resulted in a 26% reduction in both HC and CO emissions in light duty diesel engines
- Increase in cetane (from 50 to 58) also improved fuel consumption at every load level tested.

3.4 VEHICLE OPERATION

Reducing the environmental impact of motor vehicles, including reducing CO₂, is a key design input for all manufacturers as part of providing a quality product that meets the expectations of customers.

However, if appropriate market fuel quality is not available, higher exhaust emissions (both CO₂ and pollutants) will be generated with lower than expected air quality improvements and health outcomes. Also, vehicle operability and durability issues will be experienced such as:

- Reduced time between regeneration of NO_x catalysts leading to increased fuel consumption and reduced catalyst and particulate filter life
- Early activation of malfunction indicator warning lamps (MIL)
- Increased operating and servicing costs.

¹¹ World Wide Fuel Charter, 4th Edn, Technical Background for Harmonised Fuel Recommendations

Impact on fuel consumption (CO₂ targets)

The petrol fuel quality standard is important to achieve the Government's CO₂ emission outcomes through the introduction of new engine and emission technology.

For example, there is a growing inclusion of direct injection gasoline technology to deliver reduced CO₂ emissions (i.e. improved fuel consumption) with the use of lean NOx traps. Sulphur from burnt fuel is stored on the lean NOx trap and high temperature regeneration (running a rich fuel mixture) is required to remove the sulphur. The higher the sulphur level in the fuel, the more frequent regeneration is required, resulting in a higher CO₂ penalty (i.e. increase in fuel consumption), corresponding higher air pollutant emissions and reduced life of the NOx trap.

Early activation of MIL

Both Euro 5 and Euro 6 emission standards introduce additional on-board diagnostic (OBD) requirements. Currently, many brands offer desensitized Euro 5 OBD systems due to the high (i.e. >10 ppm) sulphur levels in Australian petrol. With the introduction of Euro 5 and Euro 6 air pollution emission standards, the full OBD requirements will also be introduced. To successfully operate across their full range, OBD monitors need 10 ppm sulphur petrol¹².

High sulphur petrol can cause loss of catalyst efficiency and increases the level of particulates in direct injection gasoline technology vehicles, resulting in illumination of malfunction indicator lights (MILs) on the vehicle's dashboard. This requires the vehicle to be taken to a service centre to be re-set the MIL.

The negative impact of high sulphur levels in petrol is acknowledged by the United Nations Economic and Social Council, World Forum for Harmonisation of Vehicle Regulations¹³:

“Meeting stringent emission regulations, combined with long-life compliance requirements, requires extremely efficient and durable exhaust after-treatment systems. Onboard diagnostic (OBD) systems are increasingly used to ensure that this performance is maintained over the life of the vehicle. The fuel sulphur content will negatively affect the performance of advanced OBD systems.”

¹² World Wide Fuel Charter, 4th Edn, Technical Background for Harmonised Fuel Recommendations

¹³ UN-ECE Consolidated Resolution on the Construction of vehicles (R.E.3), 25 January 2012

Increased operating and servicing costs

To meet the increasingly stringent regulatory requirements (e.g. Euro 5 doubles the durability requirement from 80,000 km to 160,000 km, requiring vehicles to continue to meet the full emission standard for 160,000 km) as well as customer expectations, vehicle manufacturers are delivering new technology.

When a vehicle operates on a lower specification fuel, there is a significantly higher servicing requirement that is directly attributable to the high sulphur levels in the petrol. This is a hidden cost to consumers that could average hundreds of dollars per year. The other downside is that manufacturers/importers won't introduce the latest (usually more fuel efficient) engine technology because of incompatibility with Australian fuel.

Also, some FCAI member companies are marketing diesel engine passenger cars that are European specification vehicles. Again there is the risk of reduced performance due to the lower quality market fuel (cetane in diesel in this case).

The potential for degraded performance, operability and durability of some vehicle technologies due to low quality market fuel could lead to reputational damage if the vehicle does not operate as expected. To protect against such damage, some brands may choose instead to restrict from Australia the introduction of new technologies that require higher fuel standards.

4.0 CONCLUSION

The FCAI welcomes the opportunity to provide a submission to the House of Representatives Standing Committee on Economics' inquiry into Australia's Oil Refinery Industry.

This inquiry presents an opportunity to recognise the link between fuel quality standards and the Government's environmental objectives through the introduction of both CO₂ emission standards and air pollutant emission standards for vehicles.

For vehicle brands to deliver the expected environmental benefits from CO₂ targets and more stringent vehicle air pollutant emission standards, it is necessary to have market fuel that meets appropriate fuel quality standards.

The absence of a concomitant fuel quality standard for in-service fuels may limit expected emissions reductions and cause operability problems (i.e. the vehicle may not operate as designed/expected) leading to a failure in public policy as well as owner dissatisfaction and reputational damage.

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