



Fuel Quality Standards – Background for the Senate Inquiry into the Motor Vehicle Standards (Cheaper Transport) Bill 2014

1.0 Fuel Quality Standards

The FCAL's longstanding position that fuel quality standards, Green House Gas (GHG) emission standards (i.e. CO₂ standards) and pollutant emission standards (i.e. ADR 79/0x or Euro 5/6) all need to be considered together, as they are all interrelated, is not a unique one. It is shared by the global automotive industry, regulators and research organisations alike.

2.0 US EPA

The US EPA stated in their Tier 3 Motor Vehicle Emission and Fuel Standards;¹

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

and

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

and

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

The US EPA Tier 3 Gasoline Sulfur program sets an in-service gasoline standard of 10ppm sulphur from 1 January 2017;²

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

3.0. European Commission

The European Commission (EC) also recognises fuel quality standards are linked to both pollutant and CO₂ standards. On their website page, "Road transport: Reducing CO₂ emission from vehicles"³ the EC state;

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

¹ US Federal Register Vol. 79 No. 81, 28 April 2014, Part II Environmental Protection Agency 40 CFR Parts 79, 80, 85, et al. Control of Air Pollution from Motor Vehicles: Tier 3 Motor Vehicle Emission and Fuel Standards: Final Rule

² United States Environmental Protection Agency, Gasoline, www.epa.gov/otaq/fuels/gasolinefuels/index.htm [accessed 7 July 2015]

³ European Commission (EC), Climate Action, Road transport: Reducing CO₂ emissions from vehicles, http://ec.europa.eu/clima/policies/transport/vehicles/index_en.htm [accessed 21 November 2014]

4.0. International Council on Clean Transportation

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

In their inaugural *State of Clean Transport Policy*⁴ report, released in 2014, the ICCT states;

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

and

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

5.0 World Wide Fuel Charter

The global auto industry position is based on the World Wide Fuel Charter⁵ (WWFC) which is an extensive and comprehensive compilation of research and testing of engine, fuel and control systems by a wide group of expert contributors. The objective of the WWFC is to promote global harmonisation of fuel to:

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

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

“Increasing the minimum octane rating available in the marketplace has the potential to help vehicles significantly improve fuel economy and, consequently, reduce vehicle CO2 emissions.” (Page 17)

and

“Sulphur removal requires prolonged rich operating conditions...” (Page 19)

Relevant to the consideration of a gasoline octane rating and level of sulphur for Australia, the WWFC outlines the required parameters for various fuel categories. The ones of specific relevance to Australia considering the current emission standards (i.e. ADR 79/04 or Euro 5) and proposed emission (ADR 79/05 or Euro 6) and fuel consumption standards are (Page 1):

⁴ Miller, Joshua D., Facanha, Cristiano, The International Council on Clean Transportation (ICCT), the State of Clean Transport Policy: A 2014 synthesis of vehicle and fuel policy development, 2014.

⁵ ACEA, Auto Alliance, EMA and JAMA, World Wide Fuel Charter, September 2013, 5th Edition, www.acea.be [accessed 9 October 2010]

Category 4:

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

Category 5:

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

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

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

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

and

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

and

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

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

6.0 Australian Fuel Quality Standards

The current Australian market fuel quality standards are lower than the WWFC recommendations. The Australian fuel quality standards, set under the authority of the Commonwealth Fuel Quality Standards Act and consequential Fuel Standard determinations, specify the following grades of petrol (gasoline);

- Unleaded petrol (ULP) - 91 RON (min) and 150 ppm sulphur (max)
- Premium unleaded petrol (PULP) – 95 RON (min) and 50 ppm sulphur (max).

The Australian fuel quality standard sets a minimum Cetane Index of 46.0⁶ which is lower than the WWFC recommendations.

A report prepared for the Australian Government in 2014 by Hart Energy, *International Fuel Quality Standards and Their Implications for Australian Standards*⁷, demonstrates where Australian fuel quality standards are behind international levels and provides a series of recommendations where

⁶ Australian Government, Department of Environment, Diesel fuel quality standard, www.environment.gov.au [accessed 14 July 2015]

⁷ Hart Energy Research and Consulting, October 2014, *International Fuel Quality Standards and Their Implications for Australian Standards*, Final Report

Australian fuel quality specifications need to be reviewed and upgraded in line with international standards.

7.0 Department of Environment

Orbital Australia reviewed existing standards and research on the impacts of sulphur levels in petrol for the Australian Commonwealth Department of the Environment in 2013.⁸

Orbital Australia and reached similar conclusions to the WWFC extracts above;

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

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

8.0 Climate Change Authority

The FCAI considers that the analysis undertaken by the Climate Change Authority when developing their cost/benefit analysis of mandatory CO₂ targets⁹ did not consider the implications of in-service fuel and subsequent in-field vehicle performance. In particular, the Climate Change Authority paper uses certification results to develop their benefit analysis. The certification fuel is 95 RON 10 ppm sulphur petrol.

If the equivalent fuel is not available in the market, it cannot be guaranteed that the same result will be delivered in service, especially if a vehicle owner is likely to use ULP which, in Australia, is currently regulated to be 91 RON 150ppm (max) sulphur. Therefore, the FCAI questions whether the full benefit as calculated will be delivered and considers that this cost/benefit analysis cannot form the basis for any regulatory analysis without additional testing to confirm in-service operation on market fuel will deliver the same result. Otherwise, to deliver the estimated benefits, the market fuel would have to be consistent with the certification fuel (i.e. 10 ppm sulphur, 95RON) to fully deliver a continued reduction in CO₂ emissions.

⁸ Orbital Australia Pty Ltd, 2013, Review of Sulphur Limits in Petrol, Produced for Fuel Policy Section, Department of Sustainability, Environment, Water, Population and Communities, 10 Jun 2013.

⁹ Australian Government Climate Change Authority (CCA), Light Vehicle Emission Standards for Australia: Research Report, June 2014

9.0 New Zealand

Recently the New Zealand government began their review of fuel quality standards and released a discussion paper that recognises the link between fuel quality standards, vehicle performance and environmental performance.¹⁰ The paper notes that fuel specifications are developed in line with international developments in vehicle technology and fuel supply.

Among other recommendations to align their fuel specifications with international levels, New Zealand propose to reduce the sulphur level in all grades of petrol from 50 ppm to 30 ppm by 1 July 2016 and then to 10 ppm sulphur by 1 July 2017. Part of the rationale is that a European study (from 2001) that found that reducing sulphur levels in petrol would provide reductions in CO2 emissions of between 1% and 5% in Euro 4 level cars.

10.0 FCAI Position

The FCAI has been consistent in its call for concomitant market fuel. This was highlighted in the FCAI's submission to the 2010 Regulatory Impact Statement (RIS) considering the introduction of Euro 5/6 emission standards. The regulation for Euro 5/6 (i.e. UN R83) specifies 95 RON 10 ppm sulphur petrol as the test fuel and the benefits estimated in the 2010 RIS for the introduction of Euro 5 and Euro 6 used the results of the regulation certification laboratory testing.

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¹⁰ New Zealand Government Ministry of Business, Innovation & Employment, Reviewing Aspects of the Engine Fuel Specifications Regulations 2011, Discussion Paper, September 2015