Australian Institute of Petroleum

Submission to the Department of Infrastructure, Transport, Regional Development and Local Government

on Draft Regulation Impact Statement

For Review of Euro 5/6 Light Vehicle Standards

15 March 2010

ABOUT AIP

The Australian Institute of Petroleum (AIP) was established in 1976 as a non-profit making industry association. AIP's mission is to promote and assist in the development of a sustainable, internationally competitive petroleum products industry, operating efficiently, economically and safely, and in harmony with the environment and community standards.

AIP member companies play various roles in the fuel supply chain. They operate all of the petroleum refineries in Australia and handle a large proportion of the wholesale fuel market. However, AIP member companies directly operate and control only a relatively limited part of the retail market.

AIP is pleased to present this submission on behalf of the AIP's four core member companies:

BP Australia Pty Ltd
Caltex Australia Limited
Mobil Oil Australia Pty Ltd
The Shell Company of Australia Limited

Contact Details

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Introduction

AIP is pleased to have the opportunity to comment on the Draft Regulation Impact Statement (RIS) for Review of Euro5/6 Light Vehicle Emission Standards. The Australian refining industry seeks to closely cooperate with regulators and the motor vehicle industry to ensure that fuel standards are introduced when vehicles requiring a particular quality of fuel arrive in the market. The refining industry has generally ensured that fuels are available to the Australian market on the time frame agreed with regulators and, therefore, has made a strong and positive contribution to the implementation of the Commonwealth Government's cleaner fuels program.

AIP and its member companies accept the community imperatives for improving urban air quality and addressing climate change and support the development of policy based on sound science, thorough economic analysis, affordability for industry and acceptability to the community.

While the draft RIS does not make any recommendations regarding fuel standards and acknowledges the policy development role of the Fuel Standards Consultative Committee (FSCC) it does cover many areas that could have implications for the future course of fuel standards. Consequently, AIP will be addressing not only the specific observations in the RIS but will also seek to address some of the broader policy context, such as motor vehicle technologies and the longer term changes in Australia's car fleet.

The draft RIS notes that the only fuel parameter of relevance for implementing Euro 5/6 motor vehicle emission standards is the sulfur level of petrol and LPG. Consequently, this submission will largely be addressing sulfur in unleaded petrol; however other factors are also relevant such as the expected take-up of motor vehicle technology and the commercial implications for the petrol market.

The RIS further noted potential implications for fuel standards of the proposed vehicle emission standard as:

- The catalyst durability requirement increases from 100,000km to 160,000km
- There is considerable variability in the sulfur tolerance of advanced emission control technologies, and their performance at various sulfur levels.
- The report states that it is widely recognised that in-service catalyst durability is affected by fuel sulfur.
- The impact on emissions performance of Euro 5/6 vehicles using petrol with sulfur levels greater than 50ppm, and/or using petrol with an octane level less than 95 RON is unclear.
- The absence of any definitive information to assess the impacts of the current level of sulfur (150ppm in unleaded petrol) on technologies likely to be used in Euro 5 standards.

AIP considers that there is clear evidence on each of these issues to show that most prospective vehicle technologies can operate satisfactorily on the current regular unleaded petrol standard at 150ppm sulfur. Based on available evidence, an advanced three way catalyst will not be damaged by sulfur and the demonstrated environmental benefits of lower sulfur levels are small. If vehicle manufacturers consider that a lower sulfur level is required, then 50ppm sulfur is available in Premium Unleaded Petrol (PULP).

Stoichiometric Gasoline Direct Injection (GDI) engines generally have lower octane requirements than current technologies. However, when used in combination with some other vehicle technologies, such as turbo-charging, it may increase the need for octane. The implication for octane requirements of the combined technologies will be technology specific as manufacturers can reduce the engine compression ratios to maintain the current octane requirements. For example, GDI models in Australia are already operating on the current ULP standard.

Although we have not specifically addressed the sulfur content of LPG in this paper, the impact of sulfur in LPG on vehicle emissions and exhaust after-treatment devices is the same as for petrol.

AIP Position

AIP considers that there are no implications for current fuel standards from setting Euro5/6 vehicle emission standards and consequently does not support any further changes to the current Australian standards for petrol. If alternative or new evidence were to become available to change this conclusion then AIP considers that the cost benefit analysis in the draft RIS should be reviewed in the context of an FSCC process to take into account factors such as increased fuel prices, refinery capital investment and potential refinery closures.

In supporting this position, AIP will present evidence and observations in this submission to demonstrate that:

1. Long term use of higher sulfur fuels does not damage catalysts.
2. Reducing the sulfur content of petrol from 150ppm to 50 ppm would not substantially reduce tailpipe emissions.
3. Tailpipe emissions improvements from lowering sulfur to 50ppm occur for some criteria pollutants that are not a concern in Australia.
4. 50ppm sulfur petrol is readily available in Australia.
5. Future motor vehicle technology developments may require higher octane fuels such as Premium Unleaded Petrol (PULP).
6. The production of 50ppm sulfur ULP would increase emissions and costs at Australian refineries.
7. The production of 50ppm sulfur ULP would adversely affect the commercial viability of Australian refineries.

1. Long term use of higher sulfur fuels does not damage catalysts

The available evidence[1] from an extensive literature review suggests that the use of fuel up to 500ppm does not have an appreciable effect on the operation of the catalysts and:

- Vehicles will still meet relevant emission standards after operation on higher sulfur fuels; and
- Even after operating for extended mileage on higher sulfur gasoline, vehicle emissions will be reduced if sulfur levels are lowered.

A limited study of two catalysts[2] concluded that catalyst aging was not affected by sulfur levels between 50 ppm and 450ppm. A further study conducted by the China Automotive Technology and Research Centre (CATARC)[3] concluded that it was clear that there was no damage to catalysts operating long term on 150ppm sulfur petrol. In a Mexican study[4], vehicles similar to Euro 3 vehicles were driven on petrol at either about 350ppm or 750ppm. After accumulating significant mileage on these high sulfur fuels, the test vehicles still met the emission standards on average and had a typical response to changing sulfur levels. Later literature reviews seem to confirm these results[5].

A further study by CONCAWE[6] concluded:

- No evidence of increased sulfur sensitivity after catalyst ageing.
- Advanced European vehicles tested showed very little short term sensitivity to fuel sulfur.
- Low emissions can be achieved without significant short-term sensitivity to fuel sulfur.
- Reductions in fuel sulfur content from 150ppm to 10ppm seem unlikely to bring substantial emission benefits for current Euro3&4 vehicle technologies.

These results are supported by anecdotal evidence from the United States from in service emissions testing and reports of on-board diagnostic malfunction indicators. It is also important to note that the durability requirement for the US requirements was 100,000 miles or 160,000km. On board diagnostics have been present in US cars since 1996 while the sulfur limit for conventional petrol was 1000ppm until 2004. Although the US national average sulfur level was around 300ppm, there were many areas which were around 800ppm and there were no reported problems of vehicles exceeding emission standards because of catalyst poisoning. Therefore, the evidence would suggest that increasing the durability requirement would not cause the concerns raised in the draft RIS about affecting the performance of the catalyst.

There are numerous studies that indicate that the relatively minor effects on emissions of using higher sulfur levels are reversed when the vehicle returns to using low sulfur fuels. A useful summary of these studies[7] concludes that studies show either complete reversibility or substantial reversibility depending on the criteria pollutant and the driving conditions. For example, it appeared that harsher driving conditions (generally experienced in Australia) will lead to greater reversibility than milder driving conditions.

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[1] Hochhauser AM, Schleyer CH, Yeh LI & Rickeard DJ (2006) *Impact of Fuel Sulfur on Gasoline and Diesel Vehicle Emissions* SAE International 2006-01-3370 p.9

[2] Bjorddal SD, Goodfellow CL, Beckwith P, Bennett PJ, Brisley RJ & Wilkins AJJ (1995) *An Evaluation of the Long Term Effects of Gasoline Sulphur Levels on Three Way Catalyst Activity* SAE International 952421.

[3] CATARC study quoted in Hochhauser AM, Schleyer CH, Yeh LI & Rickeard DJ (2006) *Impact of Fuel Sulfur on Gasoline and Diesel Vehicle Emissions* SAE International 2006-01-3370 p.5

[4] Schifter I, Diaz, L &Lopez-Salinas E (2006) *A Predictive Model to correlate Fuel Specifications with On-Road Vehicle Emissions In Mexico* Environmental Science and Technology Vol 40, No.4, pp.1270-1279.

[5] Hochhauser AM (2008) *Review of Prior Studies of Fuel Effects on Vehicle Emissions* Coordinating Research Council (CRC)

[6] CONCAWE Fuel Quality and Management Group (2003) *Fuel Effects on Emissions from Modern Gasoline Vehicles Part 1 – sulphur effects* Report 5/03 CONCAWE p39

[7] Hochhauser AM, Schleyer CH, Yeh LI & Rickeard DJ (2006) *Impact of Fuel Sulfur on Gasoline and Diesel Vehicle Emissions* SAE International 2006-01-3370 p.8

Given this evidence, AIP questions the assertion in the RIS p.13 that, "it is widely recognised that in-service catalyst durability is affected by fuel sulfur". If the statement means that catalysts would be irreversibly damaged, or that sulfur content significantly affects the aging process (i.e. higher sulfur content means greater deterioration of emissions performance over time), AIP does not believe this is supported by the literature. We consider that if this assertion were to become a basis for policy then the onus is on the Department to definitively prove this question. This could require a significant and extensive study of modern Australian vehicles that would be costly to complete.

We are not aware of any technology being constrained by sulfur levels other than lean burn gasoline direct injection engines (GDI) which must be operated on 10ppm sulfur petrol. These engines require low sulfur because the emission control technology is a lean NO_x trap. The emission control is required because of the high rates of NO_x generation in these engines because of the high air/fuel ratio. As supported by evidence presented later in this submission AIP considers that lean burn GDI is a miniscule portion of current automobile manufacturing and is declining in popularity as a technology with automobile manufacturers because of its complexity. Lean burn GDI is unlikely to ever be more than a very small niche in the automotive market.

Some technologies, such as stoichiometric GDI are potentially constrained by the octane level and some require at least 95 RON (Research Octane Number) fuel but we have not been able to find any evidence that the operability of these technologies is constrained by the sulfur level. These technologies use the conventional advanced three way catalysts and as demonstrated in the foregoing evidence there does not appear to be any catalyst damage or any other reported operability issues. Moreover, the next generation of technologies of engines, Homogeneous Charge Compressed Ignition (HCCI) and Controlled Auto Ignition (CAI) are very tolerant of fuel types and may actually require lower octane than other technologies. Later sections in this paper will expand on these issues.

Consequently, AIP considers that most of the discussion in the RIS in Section 1.5.4 Fuels and Technology Concepts requires strong supporting evidence as to significant sulfur effects on emissions yet none is presented. In particular, we question the extent to which the technology enabling benefits and so-called indirect benefits are supported by the available evidence. The conclusion on p.12 that, "It is these indirect technology-enabling benefits of low sulfur fuels that may be relevant to the standards under consideration in this RIS", is questionable and the evidence suggests that most prospective vehicle technologies will be able to operate effectively on fuel meeting the current ULP standard. AIP acknowledges that there may be technology specific differences between vehicle manufacturers If these factors are considered relevant by vehicle manufacturers with specific technologies then the use of PULP with 50ppm sulfur could be specified in the owner's manual as the required fuel for any particular vehicle and could be a warranty condition for the vehicle.

2. Reducing the sulfur content of petrol from 150ppm to 50 ppm would not substantially reduce tailpipe emissions

There have been a range of significant studies considering the effects of sulfur levels on vehicle emissions. A useful summary of the papers is provided by Hochhauser[8] and incorporates a range of fuel parameters. These studies have been conducted over a significant period of time by independent organisations and the results have been published in peer reviewed journals.

[8] Hochhauser AM (2009) *Review of Prior Studies of Fuel Effects on Vehicle Emissions* SAE International 2009-01-1811.

In the 215 petrol studies reviewed there are limitations in drawing generalisations because of:

- comparability issues between the studies because of differences in statistical approaches;
- comparability issues because of the use of different drive cycles;
- limited sample size of vehicles tested; and
- fuel properties were not independently varied so that it is difficult to ascribe any impacts to different fuel parameters.

Nonetheless, the general conclusions from this literature review appear to be that:

- The relationship between increasing sulfur levels and tailpipe emissions is linear over the range of 0ppm to 150ppm sulfur.
- The majority of these studies showed relatively small responses to sulfur changes from 150ppm to 50ppm for criteria pollutants ranging from 1% to 10% for HC, CO and NO_x.
- Particle emissions are not an issue for petrol engines and there is a question whether the levels can even be measured effectively.
- Air toxics were only measured in a limited number of studies generally on older vehicles. Reducing sulfur levels lowers emissions of the air toxics benzene and 1.3 butadiene but may increase the level of formaldehyde. It appears that the changes in the levels of toxics are between 5-10% for changes in 150ppm to 50ppm but this is not clear from the studies.
- The effect of changing sulfur levels on emissions has been consistent over time, as technology has evolved mass effects are smaller while percentage effects are similar.
- The emissions from newer fleets exhibited relatively lower responses to changes in sulfur level of fuel compared to the older vehicles.

In assessing any potential further reductions in emissions it is important to recognise the significant improvements in motor vehicle emissions that have been facilitated by the Commonwealth Government's cleaner fuels program. Since the commencement of cleaner fuel program in 2002 it is expected that criteria pollutant emissions will reduce by up to 90% by 2020. Comparing pre- 2002 emissions to the expected reductions from changing the sulfur level to 50ppm for ULP would appear to yield only about a 1% improvement. The RIS supports this general conclusion by stating that," the fuel sulfur reductions embodied in the national fuel quality standards to 2006 would have already delivered the majority of direct air quality benefits available from sulfur reduction".

The small air quality benefit would be further reduced by the greater levels of energy consumption and direct emissions from refineries caused by the more severe processing of fuel to meet a 50ppm sulfur ULP standard. As explained in more detail later in the paper, desulfurisation of petrol is energy intensive and because the process destroys octane, augmentation of high octane blendstocks production would also be required. Being more energy intensive the production of 50ppm ULP will certainly increase greenhouse gas emissions but is also likely to increase emissions of sulfur dioxide and NO_x from the refinery. The exact nature of these emissions would need to be the subject of detailed study by the Australian refineries and would be a function of the technology pathway chosen by each refinery to meet the tighter standard.

The draft RIS also produced estimates by the Bureau of Transport Infrastructure and Resource Economics (BITRE) that showed substantial reductions in NO_x levels to 2020 which thereafter rise slowly. Particulate emissions (PM) are also shown to halve to 2020, thereafter particle emissions increase over the next 20 years because of a greater number of vehicles and vehicle kilometres (VKT) travelled particularly in light commercial vehicles. As mentioned above petrol driven vehicles are not considered a significant generator of particulate emissions. Given the expected electrification of the vehicle fleet and potential advances in engine and drive train technologies, AIP considers that these long term forecasts are overly pessimistic. Consequently, we would welcome the opportunity to work with BITRE and vehicle manufacturers to develop more realistic forecasts of motor vehicle emissions.

Based on this range of evidence, AIP considers that there would only be a marginal environmental benefit in reducing sulfur in ULP from 150ppm to 50ppm. AIP also considers that it is important to consider the costs of any change including increased refinery emissions, increased fuel prices, increased refinery capital expenditure and the possible closure of Australian refineries.

3. Tailpipe emissions improvements from lowering sulfur to 50ppm occur for some criteria pollutants that are not a concern in Australia

Australia's urban air quality is generally very good with every Australian city consistently meeting the air quality levels set in the Ambient Air Quality National Environment Protection Measure (AAQ NEPM). There are issues with high particulate emissions in times of bushfires and actual and emerging ozone issues in the major cities driven by increasing motor vehicle use. For example, the NSW government reported that there is consistent compliance in NSW with national air quality standards for CO, N_20, SO_2 and lead. Therefore the reported small reductions in these pollutants will have no meaningful impact on NSW urban air quality. However, NSW still faces challenges for ozone and particulate pollution.

NSW reported that in 2008 there were only two days where ozone levels exceeded ozone standards but the relatively low level in compared to past exceedences was considered to be related to meteorological conditions. The NSW State of the Environment Report[9] goes on indicate that "no noticeable trends are discernible in either the number of exceedences or maximum concentrations" of NO_x. Given the expected trends in NO_x emissions identified by BITRE that will see a further halving of NO_x emissions between 2010 and 2015 it is reasonable to expect that there will be a downward trend in ozone levels and the number of exceedences emerging over the next decade.

AIP considers that reductions in sulfur levels will lead to small decreases in emissions. Decreases in CO and air toxics will not improve air quality in any discernable way because the levels of these pollutants are well below their relevant standards. Particulate emissions are not relevant for petrol engines. For ozone, already implemented changes in fuel standards and new regulatory measures will see the levels of NO_x emissions fall dramatically to 2020, halving between 2010 and 2015. AIP expects that a trend (that has not been evident from 1994-2008) will start to appear with ozone levels falling to be in compliance with national standards over the course of the next decade. AIP further considers that this was the intended purpose of the Commonwealth Government's cleaner fuels program and no further changes to fuel standards are required to achieve the environmental objectives.

4. 50ppm sulfur petrol is readily available in Australia

The sulfur level standard for Premium Unleaded Petrol has been 50ppm since 1 January 2008. However, the majority of the PULP pool has been at 50ppm since 1 January 2006. When the cleaner fuels program was considering the timing for the introduction of standards in the late 1990s it was anticipated that the PULP proportion of the petrol pool would be 50% by 2010. In 2002-03 the PULP proportion was 10.3% which has grown slowly to 17.3% in 2008-09 even though PULP is readily available throughout Australia.

As noted in the draft RIS, it was expected when the standards were set that the introduction of Euro 3 and Euro 4 emissions standards would mean that there would be a structural shift to higher octane fuels for new vehicles. As further noted in the draft RIS the retention of 150ppm ULP standard was seen as a 'legacy' fuel. Part of the reason why the PULP proportion has not reached expectations is that while vehicles are certified for emission standards on PULP, vehicle owner manuals advise that vehicles can satisfactorily operate on ULP.

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[9] NSW Department of Environment, Climate Change and Water (2009) *NSW State of the Environment Report 2009* NSW Government p.123.

AIP considers that if there are any concerns about catalyst durability from any particular type of emission control technology then vehicle manufacturers could specify 50ppm PULP as the required fuel for the vehicle. AIP acknowledges that once the vehicle has concluded its warranty period that there is likely to be a degree of misfuelling, particularly if motorists do not notice any operability issues. If regulators consider that this is likely to be a significant issue, i.e. misfuelling leading to higher emissions, then it raises the prospect of in-service testing as occurs in other jurisdictions in the world. On balance, AIP considers that on the evidence presented in this submission, sulfur content of ULP will not be an issue in meeting emission standards and it is the prerogative of the motor vehicle manufacturers to determine the fuel that can be used in their vehicles.

These observations strongly suggest that the continued existence of a 150ppm ULP standard is not an impediment to the introduction of Euro 5/6 vehicle emission standards.

5. Future motor vehicle technology developments may require higher octane fuels such as Premium Unleaded Petrol (PULP)

In conventional engines, fuel is generally supplied by injecting petrol into intake ports. Direct injection systems inject the fuel directly into the cylinder resulting in a cleaner burn and hence better fuel economy and lower emissions. Gasoline Direct Injection (GDI) can potentially deliver improvements in fuel economy of up to 15% depending on the drive and load characteristics. It should be noted that engine design improvements are only one strategy to improve vehicle fuel efficiency and other improvements in valve technology (variable valve timing), gearboxes (eg six or seven speed gearboxes), low friction oils, turbo- and supercharging of small displacement engines, weight downsizing and hybrids can also deliver substantial fuel economy saving. A summary of the potential gains is contained in a report by the US EPA.[10]

The dominant GDI technology is stoichiometric GDI which is being favoured by vehicle manufacturers because of its simplicity and because conventional pollution control equipment, i.e. a three way catalyst, can be utilised. Stoichiometric GDI can readily operate on 150ppm sulfur levels and depending on the engine management system may be able to operate on 91 RON. However, the general trends in stoichiometric GDI deployment suggest that downsizing and turbo charging will most probably require at least 95 RON fuels, but this will depend on the individual engine technology. AIP notes that the new Holden Spark Injection Direct Ignition (SIDI) is capable of operating satisfactorily on ULP.

In contrast, lean burn GDI operates at substantially increased air/fuel ratio and consequently substantially increases the emissions of NO_x requiring after treatment with lean NO_x catalysts. Lean burn GDI is sensitive to sulfur levels and is recommended to operate on 10ppm sulfur levels because of the need to regenerate the catalyst more frequently at higher sulfur levels, reducing the fuel economy gains. .In addition under various load and driving conditions lean burn GDI achieves economy benefits similar to stoichiometric GDI. For these reasons, market penetration of lean burn GDI has been limited and largely confined to high performance and luxury segments of the market.

Stoichiometric GDI is expected to make a fairly rapid penetration into the new car market. In 2005, the proportion of new vehicles that were using both stoichiometric and lean burn GDI was around 1% in the US and 5% in Europe. This proportion is expected to grow to 26% in the US and 30% in Europe[11]. The fleet turnover will mean that these vehicles will be a relatively small growing proportion of fleet over time but it seems likely that GDI will become the main technology in petrol markets subject to any further developments in technology. We could not exact numbers on the

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[10] US EPA (2008) *EPA Staff Technical Report: Costs and Effectiveness Estimates of Technologies Used to Reduce Light-Duty Vehicle Carbon Dioxide Emissions* United States Environmental Protection Agency

[11] Beecham M (2009) *Global market review of fuel injection systems – forecasts to 2016* Just-Auto.

proportion of lean burn versus stoichiometric GDI but we understand that the lean burn numbers are a small portion of the GDI powered new vehicles.

The American Petroleum Institute (API) is currently conducting a study into the likely penetration of different vehicle technologies and will be specifically examining the penetration of lean burn GDI and stoichiometric GDI in the major global markets. The study will be supported by extensive interviews with vehicle manufacturers and is expected to be an exhaustive assessment of vehicle technologies and likely fuel requirements. The study is expected to be completed in late April 2010 and AIP will have ready access to the results once completed.

The next round of improved vehicle technologies is likely to be Homogenous Charge Compression Ignition (HCCI) or Controlled Auto Ignition (CAI) that combine features of both spark ignition and compression ignition. In test conditions[12] these engines have shown further improvements in fuel economy with the added benefit of lower PM and NO_x emissions. In bench testing these engines have been shown to run successfully on a variety of fuels, including under part-load and full-load operating conditions. The further implication for fuel standards is that these engines may be optimised with very different fuels than currently available, such as kerosene. A further implication is that the octane requirements when operating on petrol are significantly lower as are the cetane requirements when operating on diesel.

Given the likely developments in engine technologies, AIP considers that the technology facilitation benefits have already been achieved by the introduction of the current Australian PULP standard.

6. The production of 50ppm sulfur ULP would increase emissions and costs at Australian refineries

To produce 50ppm sulfur ULP, Australian refineries would need to install additional desulfurisation capacity for the petrol streams. In addition, since the desulfurisation process destroys octane there will be a further requirement to produce additional high octane streams such as alkylate or isomerate. These operating units will also require the augmentation of electricity and water supplies and since the desulfurisation requires hydrogen, the augmentation of hydrogen production at refineries. All these processes are energy intensive and will lead to a significant increase in energy consumption and therefore an increase in greenhouse gas emissions.

These issues were examined in detail in the 2005 report by MMA[13] that found Australian refineries would need to invest $1.3 billion in capital equipment to enable the production of the 10ppm sulfur PULP. It is probable that these costs would have increased since 2005 but this would need to be the subject of detailed consideration by the Australian refineries. The report also found that under a range of plausible scenarios the introduction of 10ppm sulfur PULP would lead to net community costs. A central assumption made that is not likely to occur, was PULP would grow to 50% of the petrol pool and that lean burn GDI vehicles would become reasonably common. This has not proven to be the case and from the foregoing analysis on engine technologies it is unlikely to occur.

While the technology choice to produce 10ppm sulfur PULP is similar to that of 50ppm ULP the impacts on the refineries would need to be considered in detail, cognisant of the potential impacts on the petrol market and the availability of product in the Asian region. On balance, it is probable that the cost estimate for 50ppm ULP could be higher than the result from MMA study given that the volumes required to be processed would be considerably higher. One Australian refiner indicated in the MMA study that it was not technically or economically viable for it to implement these technology solutions and any change to the standard would lead to refinery closure. Therefore, given the

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[12] Cracknell RF, Rickeard DJ, Ariztegui J, Rose KD, Meuther M, Lamping M, Kolbeck A (2008) *Advanced Combustion for Low Emissions and High Efficiency Part 2: Impact of Fuel Properties on HCCI Combustion*
SAE International 2008-01-2404

[13] McLennan, Magasanik and Associates Pty Ltd (MMA) (2005) *Assessing the Costs and Benefits of Introducing 10ppm sulfur in Premium Unleaded Petrol* Australian Greenhouse Office

potentially large implications for Australian refiners of any change to petrol standards, AIP considers that a detailed investigation of the costs and benefits of any such changes in the fuel standards should be undertaken. We believe that there will be greater community costs than identified in the 2005 MMA study.

The current RIS specifically excludes the impacts of fuel prices on the assessment of the benefits. Given international markets demonstrate premiums for higher quality fuels and Australian refiners will be incurring substantially greater costs there may be an impact on consumers. Any change in fuel prices is a real cost to the Australian community that should be included in any assessment of proposed fuel standards changes.

In summary, any changes to the 150ppm sulfur ULP standard will be expensive, complicated and difficult to implement and will lead to greater emissions from the Australian refineries.

7. The production of 50ppm sulfur ULP would adversely affect the commercial viability of Australian refineries

In 2008, the Australian downstream petroleum industry reported a net loss of $500 million. The loss was driven by the sharp fall in the Australian dollar but also by a significant easing in global refiner margins. The trend in refiner margins that was evident before the advent of the Global Financial Crisis (GFC) and was caused by rapid increases in refining capacity largely in India, China and the Middle East. The Asian region which had a deficit of refining capacity from 2003 until 2007 moved back into surplus in 2008 and this contributed to the sharp deterioration in refiner margins. The general expectation is that the surplus in Asian refining capacity will continue for some years with the more pessimistic views suggesting that the surplus will persist until at least 2020. These developments emphasise the cyclical nature of the refining industry where long periods of economic under performance can be experienced.

The general outlook for the regional refining industry is extremely uncertain but it is certain that the Australian refining industry will be facing an extended period of significant competitive pressure. In order to remain viable the industry will be making major efforts to contain costs containment cannot afford unnecessary new capital expenditure. Consequently, we consider that great care and significant examination should be undertaken before any proposals for substantially changed operating conditions for refineries are contemplated.

The closure of Australian refineries has broader policy implications for the Australian Government than just larger imports of finished petroleum products. The Australian refining industry is a significant economic activity in its own right contributing $6.2 billion in Gross Domestic Product and underpins the competitiveness of major export industries. Recent government reports have found that Australian refining contributes to Australia’s security of liquid fuels supply by diversifying the sources of supply. The Australian refining industry is a high technology, high valued adding industry that generates many external benefits. These benefits would need to be carefully considered in light of potential regulatory actions which are likely to undermine the viability of the industry such as the introduction of the 50ppm sulfur ULP.