



Australia Marine Engine Council ...*toward sustainable boating*

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8th March 2013

Committee Secretary  
Senate Standing Committees on Community Affairs  
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Parliament House, Canberra ACT 2600 BY EMAIL: [community.affairs.sen@aph.gov.au](mailto:community.affairs.sen@aph.gov.au)

Dear Senators

### **Senate Inquiry on The impacts on health of air quality in Australia**

The Australian Marine Engine Council Inc. (AMEC) was formed by key industry representatives to represent major industry players who are unequivocally committed to sustainable boating practices. Since 2005 we have been working with national Authorities toward establishing emissions standards for small, off road engines.

In May 2010 Industry and the public were given about eight weeks to make detailed reports and the Department officers advised that the Summary Report was due to be presentation in November 2010. That report is yet to be published, and we feel that that delay has cost human health and the public purse more than was necessary.

AMEC is committed to working with industry and government to achieve sustainable emission standards as soon as practical. We believe a standard mirrored on the USA EPA 2012 standard for petrol outboards should be implemented in Australia in 2013. Every manufacturer has a full range of USA EPA compliant products at their Australian retailers today. Industry is ready.

We ask for the opportunity to address the Inquiry in person.

David Heyes  
Chairman.  
Encl.



Australia Marine Engine Council ...*toward sustainable boating*

**Submission to the:**

**Senate Inquiry on the impacts on health of air quality in Australia**

*The Australian Marine Engine Council Inc. (AMEC) was formed to represent major marine industry players who are unequivocally committed to sustainable boating practices. Our members include companies involved in the production and distribution of low emissions equipment from outboards to lawn mowers. Some of the brand names include Evinrude, Honda and Suzuki.*

**8 March 2013**

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## Executive Summary

Small, off road engines have a disproportionately high level of emissions, a fact that has been known for some time. A 1997 DEH<sup>1</sup> study explains that a lawn mower produces as much undesirable emissions as forty (40) small cars per hour of operation.

AMEC members have worked with Government since 2005 to develop emissions standards for off road engines. By 2005 the case for such standards was well established, well documented and had been legislated in other countries for some eight years.

In 2005 it seemed that off road engine emissions standards were a fait accompli, and only the implementation details needed to be ironed out. Peak Bodies called for regulations to commence in 2010, and we were led to believe that that would be achieved by 2012.

Industry has agreed that we need to adopt the USEPA standard as it was both the world's toughest standard and applied in the world's largest market. Australians will buy the cleanest products while enjoying the lowest prices and the widest range of choices.

The industry was also in agreement on limited specific exemptions, for such applications as military use and development engines.

Regulations were already overdue in 2005. The slow progress since then has meant that not only do we lag developed economies like the EU, Japan, Canada and the USA, but we now lag behind China and India in implementing off road engine emissions standards.

**Particulate Matter** emitted from small engines, especially two strokes, includes:

**Hydrocarbons:** un-burnt fuel and oil, the blue smoke of a two stroke engine. A cause of chemical smog and a range of related respiratory diseases.

**Nitrous Oxides:** which also causes a range of respiratory diseases, and in the presence of water forms Nitric Acid, which becomes acid rain, a cause of environmental degradation.

**Carbon Monoxide:** which often escapes the attention of legislators too narrowly focused on Air Shed Pollution and not on the effects that this deadly poison has on humans, especially in high concentrations that sometimes build up in homes and boat cabins.

The Government's own Cost Benefit Analysis has shown that the delays in legislating has cost the Budget \$246m in additional health costs for every year of delay.

What the CBA does not measure is the scale of human suffering that is represented by the \$246m p.a. in medical treatments.

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<sup>1</sup> DEH 1997a, *Urban Air Pollution in Australia*, An Inquiry by the Academy of Technological Sciences and Engineering, Commonwealth of Australia.

## 1.0 Background

The outboard engine market has a wide range of products. From the smallest 2 horsepower engine, roughly the size of a lawn mower engine, to a 350hp V8 engine, more powerful than the majority of today's cars.

Unlike cars, marine engines, and other off road engines sold in Australia do not need to comply with any emission standard.

Automobile emission standards began in Australia in the 1970's, while Marine engine emissions standards were first regulated at the Bodensee Lake (Europe) in 1993 for all motorized boats. The US Environment Protection Agency (EPA) regulated outboard engines emissions in 1997. California, known for being the most aggressive of US states in setting emissions standards, introduced stricter standards than the USEPA in 2001. The European Commission introduced the first emission standards for some marine engines in 2003.

Currently the world's leading standard is the USEPA 2012 standard. This standard has been mirrored in Japan and Canada and is the benchmark and the EU is working toward Harmonization.

China introduced small engine emission standards in 2010 followed by India in 2012.

Yet Australia still has no standards. There has been some progress: the Environment Ministerial Council set up Industry expert panels in 2005, reports in 2007, a series of Cost Benefit Analyses commenting in 2008 and a Public Consultation Regulatory Impact Statement in mid-2010.

That RIS was due to be reported in November 2010. But no public report or recommendations have been produced some two and a half years later. The public consultation produced few robust objections. Some submissions have argued for very specific exemptions to standards. Some have asked for regulations to be delayed until 2012. That time has come and gone.

In the meantime around half of the off road engines sold in Australia each year produce a level of emissions ten to twenty times the engines that can be sold in the USA, Japan or Canada.

Many of these engines are coming from China with emissions levels that exceed the Chinese standards. In fact, several countries are in effect "dumping" in Australia polluting products that cannot be sold in the manufacturer's home market.

It is to Australia's great shame that we allow this to continue.



*"NOT FOR SALE IN UNITED STATES" High emission engines are being dumped in Australia.*

These engines may be small, but their emissions levels are very high. This very high level of emissions from two stroke engines has been understood for some time. A 1997 DEH report<sup>2</sup> explains that a two-stroke lawn mower produces forty times the emissions of a car. Not pro-rata, but for each hour of operation. Commute an hour a day and mow a lawn twice a month and the lawn mower could produce four times the annual emissions.

To make a valid comparison of clean vs. old technology outboard engines being sold in Australia today, consider examples from the audited USEPA engine certification database. Yamaha is the market leader in outboards. This Japanese manufacturer markets in Australia an 8hp two stroke outboard, just big enough to power a small two seat open boat. Yamaha also sell a 150hp low emission four stroke, powerful enough to drive a ski boat or an offshore boat with a cabin.

The small 8hp two stroke produces more emissions per hour than the 150hp four stroke. Not just more but sixty per cent (60%) more (HC + NOx). This is typical of the huge difference in emissions between old two stroke technology and available clean technology engines. (Appendix A contains a detailed analysis)

These high emission two stroke engines are not saving Australian's money. In general the high emissions engines are cheaper to buy; which explains their popularity. However they use around 30% more fuel, rely on burning expensive two stroke oil mixed with the petrol and they wear out years earlier. The total cost of ownership is measurably higher. Banning their importation will likely save Australians money.

A full range of clean, low emission engines are already being sold in Australia, with a market share of about 50%. There is no technology to be developed, nothing new to import. The products are here, dealers and mechanics are trained. There is no impediment to, nor need for a delay.

No jobs will be lost. The management of Briggs and Stratton, manufacturer of the only two stroke made in Australia (Victa) have stated that no jobs would be lost as a consequence of emissions standards mirroring USEPA 2012.

Australia must move in the direction of the world's best practices. We are a decade late in starting and if regulations commence in 2013 it will take until 2023 for most of the current fleet of small engines be retired and replaced and for air pollutants to be drastically reduced.

The Department's CBA (DESWPC - MMA 2008) shows that every year we delay regulations costs Australia \$246m in measurable costs to the Health Budget. Real, measurable dollars.

Given that the report from the 2010 Public Consultation RIS was due in November 2010, and has yet to see the light of day, we can readily estimate that regulations have been delayed by 2.3 years at a real and measurable cost of  $\$246 \times 2.3 = \$573$  million.

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<sup>2</sup> DEH 1997a, *Urban Air Pollution in Australia*, An Inquiry by the Academy of Technological Sciences and Engineering, Commonwealth of Australia.

**DISCUSSION NOTE – The meaning of \$573 million**

*A Cost Benefit Analysis uses a technique called Discounted Cash Flow to analyse costs and benefits which occur not on the same day but over a long span of time. By taking into account time and interest/inflation factors the technique can be used to calculate with great accuracy the cost of a delay to a project of any type.*

*Government and the private sector regularly employ this same technique to claim liquidated damages. For example if the construction of an office building is delayed beyond the contracted date, the buyer suffers from the delay and so claims damages, because the benefits of earlier use of the building have been lost.*

*Along similar lines we expect Departments to make fruitful use of the assets under their stewardship. So for example, if a new office building was left vacant, while the Department continued to rent other office space for \$20m p.a. then the Department has wasted \$20m of Australian's money and should be held accountable.*

*Using the same methodology, the CBA for emissions regulations has shown that each year of delay costs the public purse \$246m. This assertion is irrefutable. That is, if the government accepts that the published CBA is correct that emissions standards will be of such a significant benefit to the public purse then delaying that cost savings is also a cost to the public.*

*Civil servants are understandably reluctant to accept that any delay, even a delay in decision making, is a real cost to the economy. But the logic is inescapable: If a project of any type has a positive benefit then delaying that project has a measurable cost.*

*In this case, the cost of the delay to date is measured at \$573m in Health related costs.*

*Sadly the \$573m that the delay has already cost Australians is more than cold, economist's numbers.*

*To attempt to translate so much money in health costs into a human context, let's assume that a Hospital stay cost \$1000 per night. That means that the human suffering was the equivalent of 674 Australians so ill they were in a Hospital bed last night. ( $\$246m/1000/365=674$ ) And the night before. In fact every night since November 2010 and every night from today onward until we have emission standards in place.*

*Of course not all the illnesses attributable to avoidable pollutants resulted in hospitalization. But we have no scale to convert between illnesses. Does one case of lung cancer = 650 Asthma attacks? Of course any attempt at such a measurement is offensive. So we use the example of 674 hospital patients just to illustrate the scale of the problem in human rather than dollar terms.*



## 2.0 Particulate matter, its sources and effects

**Particulate matter (PM)** is a term applied in at least two divergent ways. The term can be used as a collective noun for almost all airborne pollutants. Alternatively the term is sometimes used to describe only inert small particles. These inert microscopic solids or liquid droplets find their way into soft tissues, especially the lungs contributing directly to a range of well researched health problems, including Asthma, other respiratory symptoms, such as irritation of the airways, and a range of fatal and non-fatal heart diseases.

The source of PM is wide and varied. Within AMEC's area of expertise it is Diesel engines that are regulated around the world for their (inert) PM levels. (Diesel soot)

In Australia the Department (DSEWPC) commenced work on off road petrol engine emissions standards in 2005, however, work within the bureaucracy on diesel engines has barely commenced. It seems that on current projections Australia will be twenty years behind developed economies in regulating PM from highly polluting off road diesel engines.

There are many harmful emissions from internal combustion engines including unregulated off road engines. These include carbon dioxide, particulate matter, carbon monoxide (CO), hydrocarbons (volatile organic compounds) and oxides of nitrogen.

That latter three are the focus of emissions standards for off road engines in the EU, Canada and especially in USEPA 2012, the regulatory model proposed for Australia.

**Hydrocarbons (HC)** are the unburnt at partially burnt fuel and oil that is most commonly seen emitted from two stroke engines. The type of engine that are no longer sold in some countries. The great clouds of blue smoke and the oil slick on the water behind a two stroke outboard are all hydrocarbons – and a huge waste of the owner's fuel.



### Evaporative Standards

The emissions standards proposed for Australia by the Department (USEPA 2012) apply a second approach to reducing hydrocarbon emissions: evaporate standards. Quite simply a significant volume of undesirable emissions are produced when petrol is allowed to evaporate. In cars this is minimized by mandating low permeable fuel hoses, building sealed systems and adding a carbon filter to ventilation lines. This is a well-established technology.

The proposal is to mandate a similar system for boats to further reduce HC in the air we breathe. The technology and components are already available, are mostly adapted from the automotive market and are already being fitted to boats in the USA. One AMEC member is a major boat builder and has already sourced components and incorporated capacity to fit the equipment across his entire model range.

There are numerous studies showing the undesirable effect of hydrocarbons on the environment. For example, a 2006 University of Queensland study<sup>3</sup> showed that hydrocarbon levels in Moreton Bay were causing mangroves to drop albino seedlings which soon perished, leading to dieback in mangroves and loss of fish habitat. This is but one of countless similar studies.

The Department website provides a concise appraisal of the available research on the human health costs of HC exposure:

*Exposure can irritate the eyes, nose, throat and bronchial tubes. Skin contact can cause irritation or a skin allergy. Very high levels may cause headaches, nausea, damage the red blood cells, damage the liver and kidneys, and may even cause death. The International Agency for Research on Cancer has cited a number of polycyclic aromatic hydrocarbons as 'probably carcinogenic to humans', a number of others are cited as being 'possibly carcinogenic to humans'.*

*Polycyclic aromatic hydrocarbons will enter the body if we breathe in contaminated air, or consume food or water that has been contaminated. Skin contact with heavy oils or other products (creosote, roofing tar, other tars, oils) containing polycyclic aromatic hydrocarbons will result in uptake.*

**Nitrous Oxides (NOX)** combine with water in the atmosphere to form Nitric Acid - and thus Acid rain or for outboards to change the pH of the waterway. In both cases changing the acid level has a disastrous effect on plant life and the ecosystem.

Human health effects from NOX advice from the USA EPA<sup>4</sup>:

*Current scientific evidence links short-term NO<sub>2</sub> exposures, ranging from 30 minutes to 24 hours, with adverse respiratory effects including airway inflammation in healthy people and increased respiratory symptoms in people with asthma.*

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<sup>3</sup> Mangrove Moreton Bay Hydrocarbons Chlorophyll-deficient propagules of *Avicennia marina* and apparent longer term deterioration of mangrove fitness in oil-polluted sediments, Norman C. Duke and Andrew J. Watkinson. Marine Botany Group, Mangrove Ecosystem Research, Centre for Marine Studies, The University of Queensland, Brisbane, Qld 4072, Australia

<sup>4</sup> <http://www.epa.gov/oaqps001/nitrogenoxides/health.html>

*Also, studies show a connection between breathing elevated short-term NO<sub>2</sub> concentrations, and increased visits to emergency departments and hospital admissions for respiratory issues, especially asthma.*

*NO<sub>2</sub> concentrations in vehicles and near roadways are appreciably higher than those measured at monitors in the current network. In fact, in-vehicle concentrations can be 2-3 times higher than measured at nearby area-wide monitors. Near-roadway (within about 50 meters) concentrations of NO<sub>2</sub> have been measured to be approximately 30 to 100% higher than concentrations away from roadways.*

*Individuals who spend time on or near major roadways can experience short-term NO<sub>2</sub> exposures considerably higher than measured by the current network. Approximately 16% of U.S. housing units are located within 300 ft of a major highway, railroad, or airport (approximately 48 million people). This population likely includes a higher proportion of non-white and economically-disadvantaged people.*

*NO<sub>2</sub> exposure concentrations near roadways are of particular concern for susceptible individuals, including people with asthma asthmatics, children, and the elderly*

*The sum of nitric oxide (NO) and NO<sub>2</sub> is commonly called nitrogen oxides or NO<sub>x</sub>. Other oxides of nitrogen including nitrous acid and nitric acid are part of the nitrogen oxide family. While EPA's National Ambient Air Quality Standard (NAAQS) covers this entire family, NO<sub>2</sub> is the component of greatest interest and the indicator for the larger group of nitrogen oxides.*

*NO<sub>x</sub> react with ammonia, moisture, and other compounds to form small particles. These small particles penetrate deeply into sensitive parts of the lungs and can cause or worsen respiratory disease, such as emphysema and bronchitis, and can aggravate existing heart disease, leading to increased hospital admissions and premature death.*

*Ozone is formed when NO<sub>x</sub> and volatile organic compounds react in the presence of heat and sunlight. Children, the elderly, people with lung diseases such as asthma, and people who work or exercise outside are at risk for adverse effects from ozone. These include reduction in lung function and increased respiratory symptoms as well as respiratory-related emergency department visits, hospital admissions, and possibly premature deaths.*

*Emissions that lead to the formation of NO<sub>2</sub> generally also lead to the formation of other NO<sub>x</sub>. Emissions control measures leading to reductions in NO<sub>2</sub> can generally be expected to reduce population exposures to all gaseous NO<sub>x</sub>. This may have the important co-benefit of reducing the formation of ozone and fine particles both of which pose significant public health threats.*

**Carbon Monoxide (CO)** is a deadly poison, which has been demonstrably overlooked by Air Pollution regulators.

Both the EU and USEPA 2012 regulate the maximum levels of CO. In setting small engine standards the USEPA is the benchmark standard to meet. So we are pleased to see that all of the discussions to date that USEPA 2012 is the standard Australia intends to mirror.

We hypothesize that because Air Quality units in EPA type departments are charged with controlling major airsheds they ignore CO as too minor a pollutant to be singled out for attention. Even though it could be readily managed and is best managed within air quality legislation.

Along similar lines, Health Departments see other causes of death and injury as a much higher priority. It is likely that cigarette smoking and motor vehicle accidents each cause many more injuries per annum than Carbon Monoxide poisoning. Further, for a Health Department to legislate engine emissions may seem an insurmountable or even inappropriate task.

This may explain why we see that CO fall between the cracks in our bureaucracies. We urge the Inquiry to address these kinds of issues.

Carbon Monoxide is a deadly poison that is a severe and immediate risk to ordinary Australians; A health risk could be dramatically reduced with the introduction of emissions standards.

CO poisoning is of high risk because of how small engines are used. Small engines are often used in close proximity to the user and to households.

- A power tool like a chainsaw or “wiper-snipper” exhaust their toxic emissions within an arm’s length – literally!
- The exhaust of a lawn mower is no more than a metre of the operator’s nose and it is a similar situation with small outboards.
- Almost all outboards up to 15hp, and many up to 50hp, are tiller operated. The user is holding the handle on the outboard to control speed and direction, with the exhaust pipe about one metre away.

Not only is the machinery operator, like the teenager mowing the lawn at high risk, but so is the rest of the family at home. And so is the same family on their small cabin boat, with the fumes from an idling engine wafting into the small cabin and building up to dangerous levels.

Carbon Monoxide (CO) is the result of incomplete combustion, and is produced at much higher levels in inefficient engines; engines that also produce excessive levels of other emissions. Most commonly carburettor two strokes: none of which would pass USEPA 2012.

**Range of emissions: (HC + NOx) g/kw/hr for 280 Outboards sold in Australia**

	2 stroke carburettor	2 Stroke fuel injected	2 Stroke direct injection	4 Stroke carburettor	4 Stroke fuel injected
High	681	117.2	31.2	42.9	20.7
Low	123	103.6	10.6	10.9	9.0

Source: US EPA database, EFA

Looking at the table above, it is the two stroke carburettor and two stroke fuel injection engines that are the high emission engines that would not pass the proposed Australian standards. The vast majority of these are in the first column: 2 stroke carburettor.

As the table shows the arithmetic mean CO output for these engines is 403 g/kw/hr. By comparison, the mean CO level is 26 g/kw/hr. That's a significant reduction of some 94%.

That translates directly to a 94% reduction CO and thus in the risk to human health.

CO is a colourless odourless and tasteless gas, so it remains undetected. CO is readily absorbed through the lungs and attached to haemoglobin in preference to oxygen, starving the body of oxygen. Even low doses, over a few hours builds up the toxin to the level that causes headaches and drowsiness.

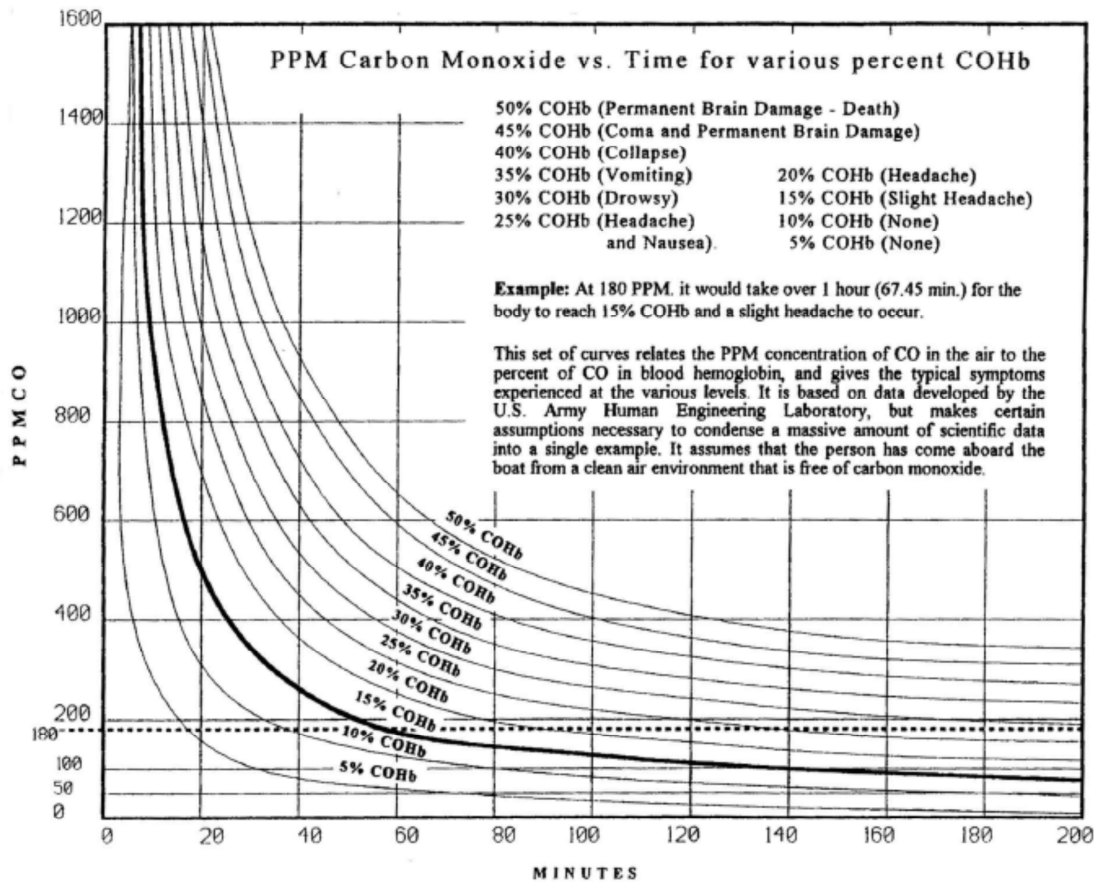
It is thought that at low levels of exposure boat drivers become distracted or disoriented, and perhaps experience similar impairment to alcohol intoxication. That then increases the risk of a boating accident.

There are reported cases of accidental drowning of young healthy teenagers who were swimming or sitting on the rear decking of a boat, near where the exhaust from an idling engine bubbling to the surface. It is thought that in several cases, the victim became drowsy and drowned as a result. The cause of death was drowning, but the CO was a significant factor.

***If engines had significantly lower levels of CO emissions there is little doubt that fatalities can be avoided. It is even more certain that illnesses from headaches to nausea and even permanent brain damage would be reduced.***

Consider the table below. At a high CO concentration of 1000PPM death will occur before 40 minutes of exposure. Recall that the clean engines have on average 94% less CO emissions. So instead of a CO concentration of 1000PPM, under identical conditions of engine size, location and wind, the concentration would be closer 60PPM.

At that level, a 40 minute exposure would not even cause a slight headache. In fact the chart shows that a continuous exposure of more than 3 hours at 60PPM would be needed before anyone experienced a slight headache.



Government measures pollutants across an entire Air Shed as a trigger for corrective action through legislation. For CO, this is a hugely inadequate approach to legislation.

As we have shown above the difference between clean and dirty engines can mean the difference between a fatality and something less than a slight headache. Yet the Department Australia specifically excluded CO from its Cost Benefit Analysis.

Nowhere in the work done to date by the Department was death and injury from CO poisoning considered. In fact the benefits of lower CO levels were specifically excluded in the CBA conducted for off road engine regulations, vis:

*Only the health impacts of avoided emissions of nitrogen oxides, hydrocarbons and particulate matter. Benefits from all other avoided emissions are ignored. Only direct health costs and lost income are considered. They ignore non-monetary losses in welfare associated with illness and the loss of life. Other water and noise pollution related damages are ignored. (MMA, 2010)*

***The steadfast focus on Air shed pollution levels have meant that the current government approach is myopic and ignores the very real danger of CO and its effects on health.***

### **3.0 Those populations most at risk and the causes that put those populations at risk**

No doubt other submissions that explain the increased risks that particulate matter presents to Australians with Asthma and other respiratory ailments. These air shed issues are well documented and well considered by a Department focussed on air shed levels.

The focus of government on air shed measurements has been myopic. Small engines are commonly used very near to the operators and passengers. Many engines are even hand held. Often the user is but an arm's length from the exhaust pipe.

That significantly increases the immediate concentration of emissions.

Combine this with the fact that the highly toxic Carbon Monoxide is ignored in Department considerations, leaves us with a dangerous blind spot in legislative planning.

These issues are discussed in greater detail in Section 2 above.

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#### **4.0 The standards, monitoring and regulation of air quality at all levels of government**

We submit to the committee that government at all levels have been remiss in its management of excessive emissions from off road engines. While regulators have continued to tighten standards for motor vehicles for the last thirty years, government has sat idly by while the problem, in fact, grows.

Australians buy about one million new cars every year.

According to the Department's 2007 Studies, Australians also buy around one million unregulated off road engines each year.

The one million cars have tight controls: Euro 5 standard.

The one million small engines are sold without any standards. And half of these one million will produce perhaps forty (40) times the emissions per hour of a car.

In regulating air quality, government at all levels have missed this low hanging fruit. This easy "fix" which will deliver early tangible benefits for Australians.

***We further submit that the current approach to the issue for regulating air quality causes a sub optimal approach to regulation.***

Government intervention in a modern economy has but one desirable goal and that is to correct for externalities. If emissions are causing harm to others (an externality), then the polluter needs to be stopped by regulation.

Reduced air quality is just one undesirable side effect of two stroke engines. So when a government is departmentalized to the extent that it only considers air quality and ignores other externalities such as water or noise pollution, then it is no surprise that regulation is not applied effectively.

Two stroke engines have many undesirable effects apart from their emissions. They are noisy, so we are not surprised to see that the EU engine standard had noise pollution standards incorporated in their engine emissions standards. Yet the reduction in noise levels, despite being well documented and submitted, has been specifically excluded as a benefit of regulation in the CBA (MMA 2010).

Two strokes also burn expensive oil and consume about 30% more fuel than is necessary. Yes the owner pays, but so does the whole economy and our Balance of Trade is weakened.

Two stroke outboards also contribute to water pollution. An outboard's exhaust pipe exits under the water. That makes it a little quieter but also causes the oil slick on the water behind every one of these two stroke outboards.

The Department quite freely admits their shortfall. In the 2008 CBA, MMA writes:

Other avoided gas emissions and avoided water and noise pollution related damages are also not considered.

Why? Why not consider avoided water and noise pollution? Surely a consideration of all the undesirable externalities is vital before legislation should proceed?

***In fact further study is not needed. The case for small engine emissions standards is overwhelmingly proven on the basis of Health costs alone. The savings in noise pollution and water pollution just make the case for regulations even stronger. Which in turn makes the delayed regulations more disappointing. We do not suggest that, at this late stage that the CBA be repeated, to incorporate noise and water pollutants.***

***The government focus on Air shed quality has led to a sub optimal management of pollutants.***

## 5.0 Other related matters

### Other Effects

We note that this Senate Inquiry addresses the impacts on health of air quality, yet we feel that a brief diversion beyond the terms of reference will illustrate some valuable factors.

The Hydrocarbons and Oxides of Nitrogen from two stroke engines that are going into our environment, both water and air are in enormous quantities and are unnecessary.

In his book "Polluting for Pleasure" Andrew Mele<sup>5</sup> claims that powerboats in the U.S. create nearly as much atmospheric pollution as all American automobiles and spill 15 times more oil into the water than the *Exxon Valdez* every year.

In Australia, we have calculated that the excess HC+NOx emissions that would no longer reach Queensland waters *alone* with outboard standards. That is, if every outboard met the proposed Australian standard, emissions into Queensland waterways would be reduced by over 350 tons per annum. To put a scale on it, that number is well in excess of the disastrous 250 ton oil spill of the Pacific Adventurer into Moreton Bay:

*Moreton Island beaches were declared "clean" in May 2009 after a massive clean-up effort following the oil spill in March.*

*About 2500 people worked on the clean-up, with around 3000 tonnes of oil-contaminated sand removed from Moreton Island.*

*The oil spill occurred on 11 March 2009, when 250 tonnes of oil escaped from the container ship Pacific Adventurer and washed up on Sunshine Coast beaches, Bribie Island and Moreton Island.<sup>6</sup>*

Environmental impacts are not measured or accounted for. For example nitrous oxides are the precursor to acid rain and hydrocarbons in waterways are blamed for dieback of mangroves and fish habitat.

Increased safety from the planned CO limits on engines is not included as a benefit in the CBA. Death and injury from Carbon Monoxide build up in boat cabins and around the home is a real risk. Maritime Safety NSW warns that "*Long periods of exposure to low concentrations or short periods of exposure to high concentrations of carbon monoxide can result in death or serious injury. Carbon monoxide in high concentrations can be fatal in a matter of minutes.*"<sup>7</sup>

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<sup>5</sup> Mele, A "Polluting for Pleasure" Andrew Mele, Norton & Company Limited, W. W. (ISBN 0-393-03510-7)

<sup>6</sup> <http://www.qld.gov.au/oil-spill/index.html>

<sup>7</sup> <http://www.maritime.nsw.gov.au/campaigns/co.html>

So we submit that there is more to this matter than simple air pollution and much to be learned, and measured from the way these proposed regulations are being mishandled. And in a broader sense, how government at all levels is permitted to remain narrowly focussed and to have greater accountability for delayed delivery of standards which would save the public purse millions of dollars each year.

### **Next Steps**

We need to look deeper to consider why Commonwealth Legislation is the preferred option to significantly reduce the human health costs associated with small engine emissions. For some years Australia has been working hard to overcome the shortfalls in the Constitution of our country. We have been moving to single national standards for everything from school curriculum to road rules.

It is sometimes said in the boating industry that we are twenty years behind the Car Industry. There is a certain truism in that. We are a smaller industry facing similar issues. Currently and for the last few years, the Boating Industry has been moving toward an enforceable boat building standard similar to the ADR for Automobiles. This should dovetail with emissions standards.

While an NEPM is a valuable tool in developing environmental standards, it falls short of what is required from a broader public interest. In making NEPMs, the NEPC must have regard to the considerations detailed in section 15 of the NEPC Act, and include:

- consistency with the Intergovernmental Agreement on the Environment
- environmental, economic, and social impacts
- relevant international agreements, and
- regional environmental differences.

An NEPM would therefore ignore for example, design consideration requirements for safer boats. Or for example, the environmental priorities of Carbon Monoxide may be relatively low, but CO reduction is of vital concern for Boating Safety Authorities.

The Boating Industry needs a coordinated set of Industry specific and coordinated legislation and standards. The successful model is the Automotive Industry's Australian design Rules (ADR's)

***Specific, and not omnibus, small engine emissions regulations, administered by the Commonwealth is the option best meets the broader public interest.***

There are no manufacturers of small off road engines in Australia (except the 1950 designed high emission Victa two stroke lawnmower engine). That means that emissions standards can be effectively controlled by Australian Customs, at the point of importation.

This solution is workable, irrespective of the engine being part of a completed product like an outboard or generator, or an engine that will be assembled into a pump or lawn mower by an Australian manufacturer

Thus we say that a single Commonwealth legislation, enforced by Australian Customs, would fit best with the public need.

## **6.0 Conclusion**

Small engine emissions in Australia are avoidably high, and so there are human health costs that can be readily avoided. Australians and Industry are ready for legislation that will reduce the Health Care bill by some \$246m per year.

Our understanding is that the delay has been caused in part by the changes to the way that State/Federal environmental cooperation is being managed, and by the revised priorities. In particular the development of a much broader set of regulations has meant that this “ready to go” legislation has been put on ice.

The delay to these regulations has passed the two year mark and by the governments own measure that has cost the Budget over \$500m. But that’s just dollars in the health Budget. Behind those dollars is real human suffering and tragedy.

This delay has resulted in unacceptable costs. Small engine emissions standards need to be expedited. Small engines can be regulated now, and when the government’s broader legislation is ready, the 2013 regulation can be merged or repealed by the next Act.

Gary Fooks for AMEC  
8 March 2013

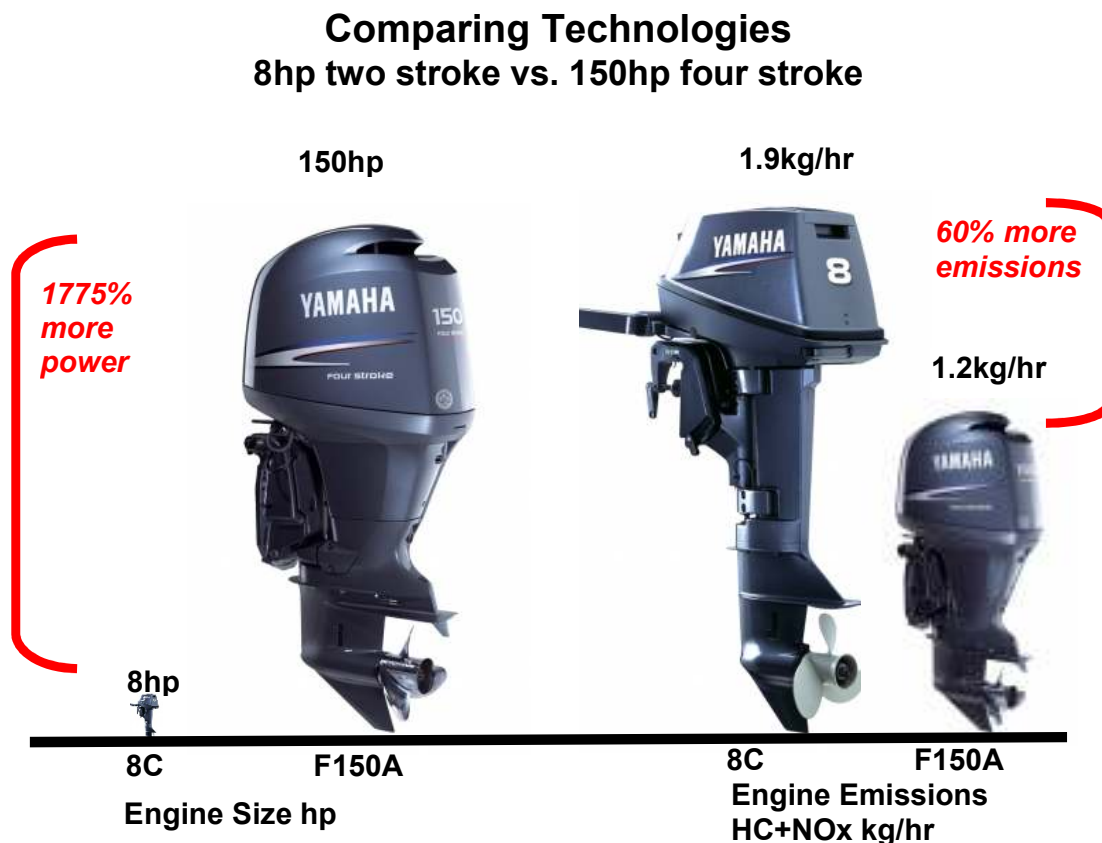
## Appendix A

A case study of two outboards brings the relative emissions of two stroke and four stroke engines into stark contrast. To isolate any brand differences we compare two engines from the market leader Yamaha. With a 34% market share, this Japanese company distributes a full range of clean and dirty engines.

The eight horsepower Yamaha 8CMHS model is a 165cc two stroke weighing 27 kg. Referred to as a Portable engine it is described in the Yamaha catalogue as “Great for car toppers, small fishing rigs, inflatables and tenders”.<sup>8</sup> Its HC+ NOx are rated by the manufacturer as 322.7 g/kW/hr. We rate this as a zero star emissions level.

At the opposite end of the Yamaha catalogue is the 150hp four stroke. The Yamaha F150A is described as a high power model, and listed as a four cylinder, 2670 cc model weighing 217kg. This would suit a boat in the 5m or 6m class; a boat that would normally need a 4wd to tow it to the boat ramp. Its HC+ NOx are rated by the manufacturer as 10.8 g/kW/hr: 3 star.

**Figure 1.2 Engine Emissions Comparison**



Source: data USEPA Emissions database, photos [www.yamaha-motor.com.au](http://www.yamaha-motor.com.au)

<sup>8</sup> <http://www.yamaha-motor.com.au/products/marine-outboard/2-stroke-portable/10-8c>

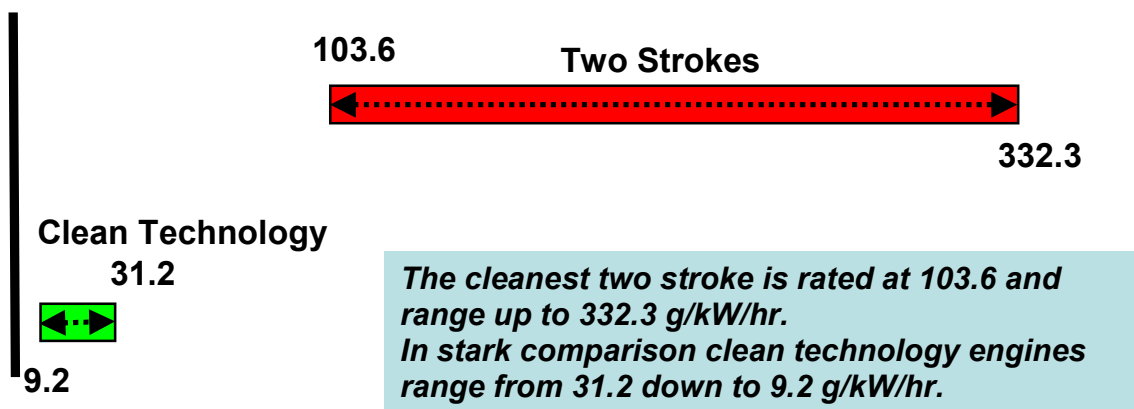
Multiplying the horsepower rating by 0.75 to convert it to kilowatts, and then multiplying the emissions ratings by the kilowatts we end up with the average emission per hour in grams. The result of these calculations is that the portable 8hp pushes out at **1.9kg** of HC+NOx per hour and the sizable 150hp clean technology engine emits only **1.2kg** per hour.

*The small two stroke produces 60% more emissions than the large clean technology engine.*

The above example illustrates the dramatic difference in emissions levels between clean and even small two stroke engines. It soon becomes clear why any form of exemption from emissions standards for small engines is an unacceptable option.

**Figure 1.3 Range of Emissions by Technology**

### Range of Emissions - Two Stroke vs. Clean Technology (HC+NOx g/kW/hr)



Source: data USEPA Emissions database, manufacturer catalogues, clean = Di two stroke + 4 Stroke i.e. CARB 2 and 3 Star