REDUCING EMISSIONS FROM NON-ROAD SPARK IGNITION ENGINES AND EQUIPMENT

CONSULTATION REGULATION IMPACT STATEMENT

May 2010

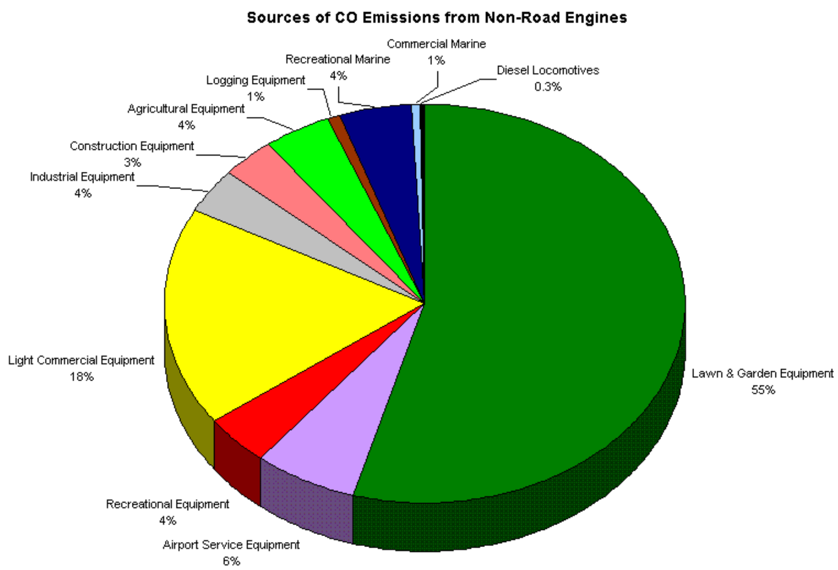
Prepared by the Non-Road Engines Working Group on behalf of the Environment Protection and Heritage Council

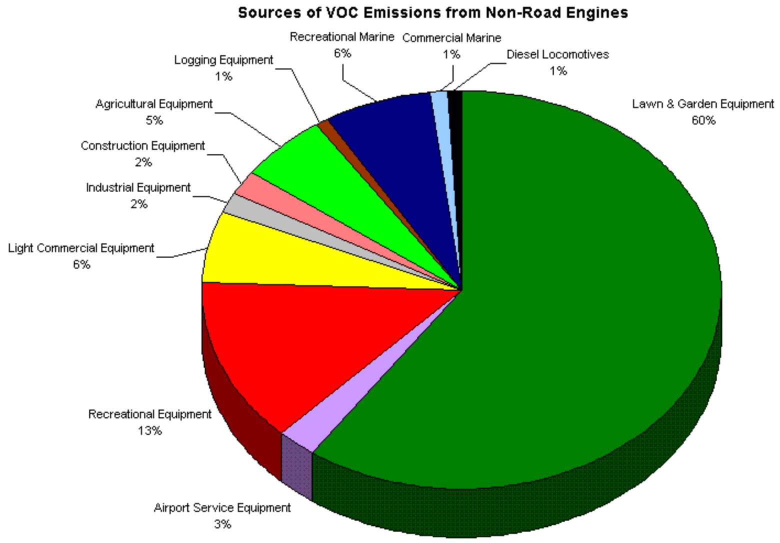
EXECUTIVE SUMMARY

Air pollution contributes to premature deaths and an increase in hospital admissions arising from health-related problems such as cardiovascular ailments, respiratory disease and cancer. Urban air pollution in Australia results in more than 3,000 excess deaths annually, with air pollution health costs due to mortality alone estimated to be in the order $18 billion per annum. While ambient levels of some air pollutants have fallen over the last 20 years, ozone and particulate matter (PM) levels are of concern, with peak levels often at or above national air quality standards and showing no consistent downward trend, especially in major cities.

Non-road spark ignition engines and equipment, particularly conventional two stroke engines used in the gardening sector (e.g. lawn mowers and outdoor handheld equipment) and the marine sector (e.g. outboard engines and personal watercraft) contribute to urban air pollution and are high polluters relative to their engine size and usage. On an individual engine basis, even the better-performing non-road engines emit disproportionately higher levels of air pollutants when compared against typical modern car engines. For example, one hour of operation of a brushcutter certified to US standards produces around the same emissions of air pollutants as ten cars operated over the same period.

Air pollutants emitted from non-road spark ignition engines and equipment include nitrogen oxides, volatile organic compounds (VOC), carbon monoxide, air toxics including benzene and polycyclic aromatic hydrocarbons (PAHs) and particulate matter. These emissions result in direct health impacts, and some also contribute to indirect health impacts through the formation of ground-level ozone, an indicator of photochemical smog. These engines also produce emissions in addition to exhaust gases that can impact on water and soil quality. For example, carburetted two stroke engines can emit up to 30% of their fuel unburned into the water or atmosphere, and these high-emission engines are prohibited on some lakes in California. The following graphs show the major contribution of lawn and garden equipment and recreational marine equipment to urban non-road emissions of carbon monoxide (59%) and volatile organic compounds (66%), which are key precursors of ground-level ozone.





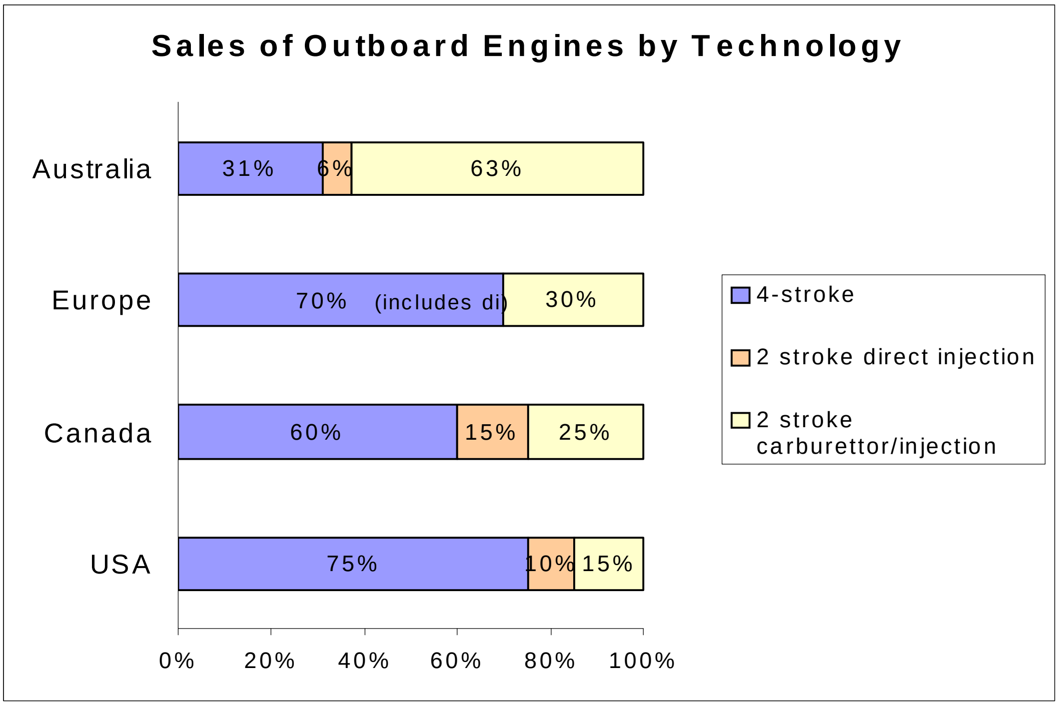
An assessment of health costs arising from lifetime emissions of air pollutants from a single unit of a non-road spark ignition engine in Australia found that health costs of non-compliant engines were far higher than those for engines compliant with overseas standards. Therefore, a significant reduction in heath costs arising through air pollutant emissions from non-road spark ignition engines and equipment can be achieved through regulating the market.

In the case of marine engines, the difference in externality costs between compliant and non-compliant engines was found to be over $9,000 per outboard engine and nearly $7,000 per personal watercraft. However, compliant outboard engines only cost, on average, around $3,000 more than non-compliant engines. Similarly, externalities for non-compliant personal watercraft were around $6,500 higher than those of compliant craft, but the purchase cost is only $500 lower for non-compliant personal watercraft. This provides a distorted price signal to the outboard engine and personal watercraft market, and encourages socially inefficient market outcomes.

For the gardening sector, the cost of engines that are compliant with current US emission standards were found to be the same as unregulated engines. However, the average costs of externalities associated with engines that are compliant with overseas standards were approximately half those for the average of unregulated engines for brush cutters, trimmers and blowers, and about 20 % less for lawn mowers.

Currently, there are no national regulations in Australia that restrict emissions from non-road spark ignition equipment and engines. In contrast, national emission standards for motor vehicles have been in force since 1972. Motor vehicle standards and associated fuel quality standards are continually reviewed and strengthened to incorporate advances in vehicle technology and fuel quality.

The US introduced regulations for non-road spark ignition engines and equipment in 1995 and Europe established regulations in 2003. Emission standards for these engines and equipment in Canada and Europe are based on US standards. The graph below shows that the Australian market for outboard engines currently includes a far lower proportion of lower emitting engines (i.e. four stroke and direct injection two stroke engines) than the regulated markets in Europe, Canada and US.



This consultation regulation impact statement (RIS) examines whether there is a case for government action to reduce adverse impacts of non-road spark ignition engines and equipment on human health and the environment. The range of engines and equipment covered in this consultation RIS is shown in the table below.

Spark-Ignition Garden Engines and Equipment	
Small spark ignition non-handheld equipment < 225 cm^3 capacity	e.g. Walk behind lawn mowers, Small electrical generators, Pressure washers
Small spark ignition non-handheld equipment ≥225 cm^3 capacity	e.g. Ride-on mowers, Zero-turn mowers, Larger electrical generators
Small spark ignition handheld equipment	e.g. Line trimmers, Edgers, Leaf blowers, Chainsaws
Spark-Ignition Marine Engines and Equipment	
Outboard engines Personal watercraft Stern drive engines and equipment Inboard engines and equipment	

A number of options to reduce emissions from non-road spark ignition engines and equipment are assessed in this RIS. Following an initial assessment, which identified some management options as being not feasible, three feasible options to deliver national emission standards were assessed for costs and benefits:

- A voluntary industry agreement, including sales target – outboard engines only
- Commonwealth regulation – all specified garden and marine engines/equipment
- National Environment Protection Measure (NEPM) – all specified garden and marine engines/equipment

The emission standards proposed for adoption in Australia are the most recent US standards, promulgated in 2008, which include more stringent exhaust emission standards and, for the first time, evaporative emission standards. US standards were selected because the major Australian distributors of relevant engines and equipment are international companies that also distribute engines in the US, and are familiar with US standards.

Two scenarios were assessed for impacts for each of the three feasible delivery options: a 15% sales target to be met in 2020 and 2012 for the voluntary outboard industry option; and a phased (two-step implementation) and non-phased (one-step implementation) approach for each of the Commonwealth regulation and NEPM options. The net present values (NPV) to 2030 for these six scenarios are set out in the table below.

NPV (2008 $million) Voluntary Outboard Industry Agreement with Sales Target for High-Emission Engines		NPV (2008 $million) Commonwealth Regulation		NPV (2008 $million) National Environment Protection Measure	
In 2020[1] (scenario 1a)	**In 2012[2] (scenario 1b)**	**Phased, or two-step[3] (scenario 2a)**	**Non-Phased, or one-step[4] (scenario 2b)**	**Phased, or two-step[3] (scenario 3a)**	**Non-Phased, or one-step[4] (scenario 3b)**
580	1,195	2,950	2,993	2,471	2,514

[1]**Outboard engines**: Sales target of 15% high-emission engines (zero- and 1- star) met in 2020
[2]**Outboard engines**: Sales target of 15% high-emission engines (zero- and 1- star) met in 2012
[3]**Outboard engines and personal watercraft**: US 2006 exhaust emission standards implemented from 2012, with US Final Rule exhaust and emission standards implemented from 2015
Garden equipment: US 2006 exhaust emission standards implemented from 2012, with US Final Rule evaporative emission standards implemented from 2015 – the impacts of US Final Rule exhaust standards were not assessed
[4]**Outboard engines and personal watercraft**: US Final Rule exhaust and evaporative emission standards implemented from 2012
Garden equipment: US 2006 exhaust emission standards and US Final Rule evaporative emission standards implemented from 2012 – the impacts of US Final Rule exhaust standards were not assessed

The NPV in the table are conservative because they only include the health impacts of avoided emissions of nitrogen oxides, volatile organic compounds and particulate matter, and only direct health costs and lost income are considered. NPV estimates ignore non-monetary losses in welfare associated with illness and loss of life. Other avoided emissions, including water and noise pollution impacts are also not costed.

All feasible options to implement emission standards lead to a net benefit. However, the NPV associated with introducing national emission standards through a NEPM or Commonwealth regulation are significantly higher than for the voluntary outboard industry agreement option. Overall, it is clear that adopting US emissions standards in Australia would bring significant community benefits.

The earlier that legislation is implemented, the greater the benefits that will be realised, as every non-compliant engine sold gives rise to more costs than benefits regardless of when it is sold. The impacts of accelerating and delaying the implementation of national emission standards from the base year of 2012 for each of the sectors assessed are shown in the following table:

Start year	NPV				
	Outboard	Personal Watercraft	Garden	Total	Delay Costs (cumulative)
2010	2,641	117	768	3,526	-533
2011	2,414	108	729	3,252	-274
2012	2,202	99	692	2,992	0
2013	2,002	91	653	2,747	246
2014	1,815	84	615	2,514	479
2015	1,640	77	576	2,294	700
2016	1,476	70	538	2,085	909

The voluntary outboard industry agreement option is the least effective of the three policy options because it allows outboard engines to be sold that are not compliant with US standards. Even if the assessment had shown larger net benefits from the industry agreement option, strong doubts about the merit of its implementation would remain, as experience indicates that voluntary schemes for other sectors have largely failed to deliver beyond business as usual.

Commonwealth regulation through a non-phased approach is the preferred option. This option has an NPV of $2,950 million, and it gives rise to $479 million additional NPV compared to the equivalent NEPM option. The additional NPV is based on the assumption that a NEPM will need an additional two years to implement national standards, when compared against the Commonwealth regulation approach.

Overall, the preferred approach is the adoption of US emission standards in force at the time regulations are implemented in Australia (i.e. a non-phased approach), through Commonwealth regulation, with regulations to take effect as soon as practicable, i.e., scenario 2b.

LIST OF ABBREVIATIONS

2c	Two stroke carburetted engine
2i	Two stroke injected engine
2di	Two stroke direct injected engine
4c	Four stroke carburetted engine
4i	Four stroke injected engine
ABT	Averaging, banking and trading
BAU	Business as usual
BTRE	Bureau of Transport and Regional Economics
CARB	California Air Resources Board
CO	Carbon monoxide
DEWHA	Department of the Environment, Water, Heritage and the Arts
EC	European Commission
EPHC	Environment Protection and Heritage Council
EU	European Union
Grd-1a	Gardening equipment scenario one – non-phased approach
Grd-2a	Gardening equipment scenario two – phased approach
HC	Hydrocarbon
IA-1	Industry agreement scenario one – full compliance by 2012
IA-2	Industry agreement scenario two – full compliance by 2020
ICOMIA	International Councils of Marine Industry Associations
MMA	McLennan Magasanik Associates
NPV	Net Present Value
NEPM	National Environment Protection Measure
NMSC	National Marine Safety Committee
OB-1a	Outboard engines scenario one – non-phased approach
OB-2a	Outboard engines scenario two – phased approach
OEDA	Outboard Engine Distributor Association
OPEA	Outdoor Power Equipment Association
NEPM	National Environment Protection Measure
PM	Particulate matter (subscripts indicate the PM size in microns, e.g., PM_{10} indicates particulate matter smaller than 10 µm)
PWC	Personal watercraft
PWC-1a	Personal watercraft scenario one – non-phased approach
PWC-2a	Personal watercraft scenario one – phased approach
NOx	Oxides of nitrogen
NO_2	Nitrogen dioxide
US EPA	United States Environment Protection Agency
VELS	Voluntary emissions labelling scheme
VOC	Volatile organic compounds
VTPI	Victorian Transport Policy Institute

1. INTRODUCTION

Emissions from the following non-road spark ignition engines and equipment contribute to air pollution in Australia, particularly in Australia's urban centres:

- Small non-road spark ignition engines and equipment rated below 19 kW used in household equipment and commercial applications:
  - Lawn and garden equipment
  - Utility vehicles eg. ride on mowers
  - Electrical generators
  - Construction, farm and industrial equipment
- Marine spark ignition engines and vessels:
  - Outboard engines
  - Personal watercraft (PWC)
  - Sterndrive and inboard engines

Air pollutants emitted from non-road spark ignition engines and equipment include nitrogen oxides (NOx), volatile organic compounds (VOC), carbon monoxide (CO), air toxics including benzene and polycyclic aromatic hydrocarbons (PAHs) and particulate matter (PM). These emissions result in direct health impacts, and some also contribute to indirect health impacts through the formation of ground-level ozone, an indicator of photochemical smog (US EPA, 2008 A).

Currently, there are no national regulations in Australia that restrict air pollutant emissions from such engines and equipment. Regulations that restrict the sale of new non-road spark ignition engines have been in force in North America and Europe for a number of years.

This consultation regulation impact statement (RIS) examines whether there is a case for national action to reduce emissions from these engines and equipment, and assesses a number of options to reduce emissions:

- A voluntary industry agreement to establish a national labelling scheme and sales target for low-emission engines
- Individual State/Territory-based regulations to establish emission standards
- Commonwealth regulation to establish emission standards
- A National Environment Protection Measure to establish emission standards

This RIS assesses the costs and benefits associated with implementing selected management options and their impacts on affected parties.

Throughout this consultation RIS, the term "non-road spark ignition engines and equipment" means the engines and equipment described above, which are those covered by current US Environment Protection Agency (US EPA) regulations.

Feedback from stakeholders is sought on the issues raised in this consultation RIS, and the key assumptions underlying the impact analysis. In particular, comment is sought on the following:

- Sales data for non-road spark ignition engines and equipment – see Sections 3.1.1 and 3.1.2
- Likely compliance with overseas standards of non-road spark ignition engines and equipment purchased in Australia – see Sections 3.1.1 and 3.1.2
- Purchase costs of compliant and non-compliant non-road spark ignition engines and equipment – see Section 3.3.2
- Methodology for determining emissions performance of compliant and non-compliant non-road spark ignition engines and equipment – see Section 7.2
- Methodology for determining health costs of emissions from non-compliant non-road spark ignition engines and equipment – see Section 7.2
- Costs of implementing different policy scenarios – see Table 7.4
- Feasibility and associated costs for industry to meet US emission standards through phased and non-phased approaches on various starting dates – see Section 7.4.2.

Following stakeholder feedback on this consultation RIS, a decision RIS will be presented to Environment Protection and Heritage Council (EPHC) ministers on the preferred option to manage emissions from non-road spark ignition engines and equipment. EPHC will then make a decision on the way forward.

2. THE PROBLEM

2.1 Air Pollutants and Health Impacts

Health studies show that there is a strong association between exposure to air pollutants and health impacts. These impacts vary from pollutant to pollutant. Air pollution contributes to premature deaths and numerous health-related problems, such as cardiovascular ailments, respiratory disease, and cancer. The Burden of Disease Study (AIHW, 2007) determined that urban air pollution in Australia results in more than 3,000 excess deaths annually.

National air quality standards have been set under the Ambient Air National Environment Protection Measure (AAQ NEPM) for the “criteria” or common air pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), lead (Pb), ozone (O_3) and particulate matter, or PM (NEPC, 2003 A).

Ambient air benchmarks have also been set under the Air Toxics National Environment Protection Measure (AAT NEPM) for selected air toxic pollutants: benzene, toluene, xylene, formaldehyde and polycyclic aromatic hydrocarbons (PAHs). The principal purpose of these air quality standards is to protect human health (NEPC, 2003 B).

Recent medical evidence suggests that a number of pollutants, including ozone, PM, NO_2, benzene and PAHs, do not have a threshold below which health effects are not observed, with health impacts observed at ambient levels found in Australian cities (NEPC, 2007 & WHO, 2003). Therefore, there are significant health benefits to be realised by reducing levels of these pollutants, even when they are below levels specified in air quality standards. The health impacts that can result from exposure to air pollutants emitted from non-road spark ignition engines and equipment are described below (NEPC, 1998).

Carbon monoxide (CO) adversely impacts on human health by reducing the amount of oxygen that can be carried in the blood to the body organs and tissues. When CO is inhaled into the lungs, it combines selectively with haemoglobin (the oxygen transport protein in red blood cells) to form carboxyhaemoglobin. Haemoglobin that has been thus transformed is no longer available for oxygen transport and, as a result, the brain, nervous tissue, heart muscle and other specialised tissues, which require large amounts of oxygen, may not receive sufficiently oxygen to function optimally.

High levels of exposure can lead to poisoning, coma and death. In addition to its direct health impacts, CO also contributes to ozone formation through reaction with volatile organic compounds.

Nitrogen dioxide (NO_2) contributes to mortality and morbidity, especially among susceptible groups such as young children, asthmatics and individuals with chronic bronchitis and related conditions. Exposure to nitrogen dioxide leads to coughing, wheezing and respiratory infections in these groups. Nitrogen oxides (NOx) are an important precursor for the development of photochemical smog and secondary particulate matter.

Ozone (O_3) can trigger a range of health problems, including chest pain, coughing, throat irritation and congestion. It can also worsen bronchitis, emphysema, asthma, reduce lung function and inflame the lining of the lungs. Repeated exposure may permanently scar lung tissue.

Ozone is an indicator of photochemical smog which is not emitted directly from ambient sources but is formed when precursors, such as CO, NO_2 and volatile organic compounds (VOC), react in the presence of sunlight. This process also leads to the formation of secondary PM, which can be a significant contributor to the ambient PM load in some airsheds.

Particulate Matter (PM) can affect the lungs and heart. The size of PM is directly linked to its potential for causing health problems, with PM less than 10 microns in diameter (PM_{10}) posing the greatest problems, as these can get deep into the lungs.

Health studies link PM pollution exposure to a range of health impacts including increased respiratory symptoms, decreased lung function, aggravated asthma, chronic bronchitis, irregular heartbeat, nonfatal heart attacks and premature death for those with existing heart or lung disease.

2.2 Urban Air Quality in Australia

Although Australia is highly urbanised, air quality in Australian cities is generally good compared to cities in other developed countries. However, air pollution is still a problem for some communities (OECD, 2007).

During the last decade, there has been a significant downward trend in ambient levels of some air pollutants. Ambient lead concentrations are around one-tenth of the lead standard specified in the AAQ NEPM and do not present a significant health concern in major cities. Similarly, notable decreases in ambient levels of sulfur dioxide, carbon monoxide and nitrogen dioxide have been observed in Australia’s major cities, to the point where they do not exceed AAQ NEPM standards, except in cities where there are major point sources of these pollutants. However, ozone and PM levels are of concern, often presenting peak levels at or above the AAQ NEPM standards with no consistent downward trend, especially in the major cities (DEH, 2004).

Importantly, Australia’s increasing population, along with an associated increase in vehicle and energy use, and the expected hotter temperatures as a result of climate change, are predicted to result in conditions that are more conducive to ozone production and higher levels of PM in ambient air, particularly in urban areas. These factors will make it even more problematic to maintain and improve air quality (DEWHA, 2008).

2.3 The Contribution of Non-Road Spark Ignition Engines and Equipment to Air Pollution in Australia

Non-road spark ignition engines and equipment are high polluters relative to their engine size and usage. These engines emit significant quantities of VOC and NOx, which contribute to photochemical smog in summer. They also emit CO, PM and a range of air toxics (US EPA, 2008 A).

In Australia, non-road engines contribute 3 - 7% of CO and VOC emissions in urban environments, with the weekend summer time contribution estimated to be in the order of 20% for both these pollutants (PAE, 2007).

Garden equipment and recreational marine equipment are major contributors to urban non-road emissions of air pollutants. Figures 2.1 and 2.2 illustrate that the contributions of these combined sectors to urban non-road emissions of CO and VOC are 59% and 66%, respectively.

Figure 2.1 Major sources of non-road CO emissions in urban Australia (PAE, 2005)

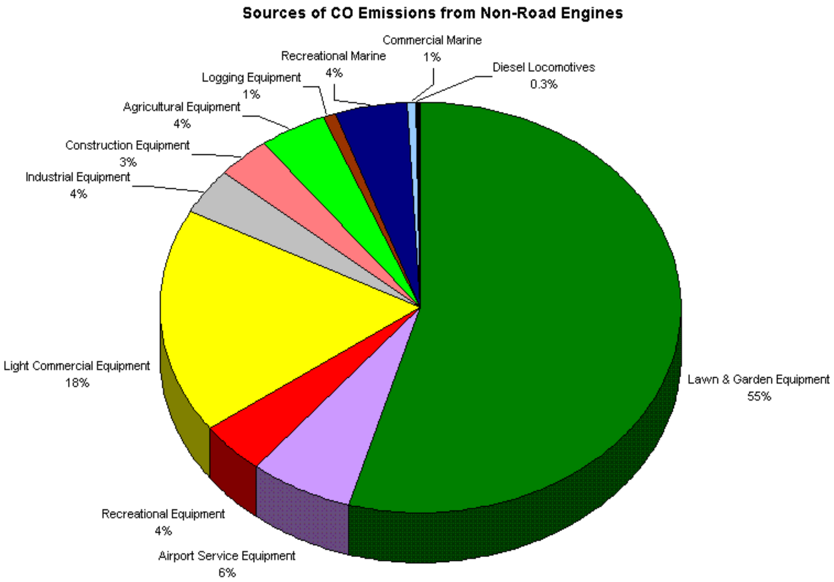
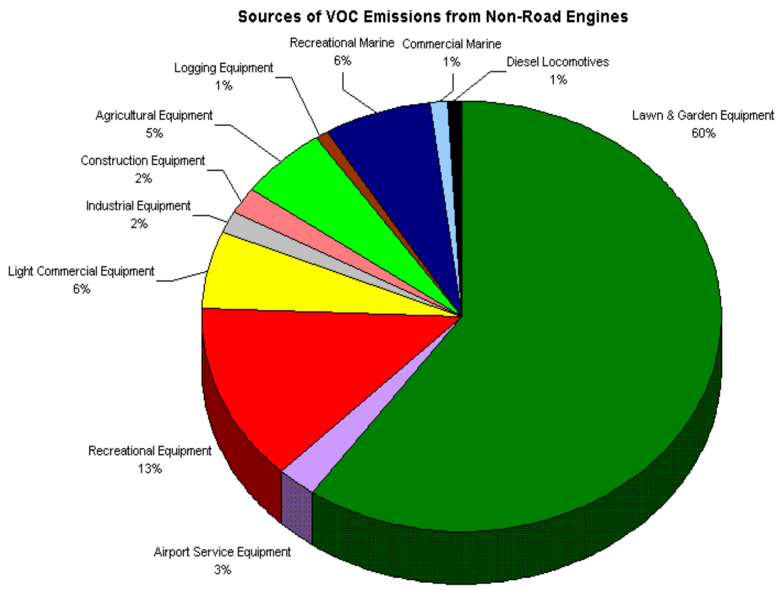


Figure 2.2 Major sources of non-road VOC emissions in urban Australia (PAE, 2005)



3 THE CASE FOR GOVERNMENT INTERVENTION

3.1 Australian Market for Non-Road Spark Ignition Engines and Equipment

3.1.1 Garden Equipment Engines

The Australian garden equipment market is diverse, with at least 43 major equipment distributors marketing 97 brands. In 2004 there were around 1,200 garden equipment models available for sale in Australia that would be subject to regulation in the US and Europe, and more than 90% these are imported.

Table 3.1 shows sales trends over 2002 - 2006 for garden equipment. The peak industry body for garden equipment in Australia, the Outdoor Power Equipment Association (OPEA), estimates that 40% of garden products are sold through importers that are not linked to manufacturers of US or EU certified equipment. However, the source of some products sold in Australia is difficult to ascertain. OPEA members have expressed concern regarding the increasing sales of imported high-polluting two stroke engines from countries that do not have emission standards. For example, an industry representative reports that garden equipment manufactured in China using outdated designs and tooling are being sold in Australia at about 30% of the price of traditional brands and very low cost generators from China now account for around 70% of total sales. The increase in the sales of two stroke handheld engines over 2002 - 2006 period lends support to OPEA's views (Environment Link, 2007 A).

Table 3.1 Sales data for garden engines and equipment (Environment Link 2007 A)

	2002 2 stroke (1,000)	**2005-6 2 stroke (1,000)**	**2002 4 stroke (1,000)**	**2005-6 4 stroke (1,000)**	**2002 TOTAL (1,000)**	**2005-6 TOTAL (1,000)**
Walk behind mowers	170	72	76	351	246	424
Brushcutters/trimmers	12	321	180	17	192	339
Chainsaws	0	152	90	0	90	152
Chipper shredders	60	0	0	46	60	46
Blower/blower vacuums	0	98	50	11	50	109
Ride on mowers	25	0	0	51	25	51
Generators	32	11	0	96	32	107
Hedge trimmers & others	192	40	28	0	220	40
TOTAL	**491**	**694**	**424**	**476**	**915**	**1267**

A survey of garden equipment models available in Australia and their compliance with overseas standards was conducted (Environment Link, 2007 A). Results from the survey are summarised in Table 3.2, which shows the expected compliance of garden equipment available for sale in Australia with European or US requirements, based on limited information provided by industry.

Table 3.2 shows that less than half of garden equipment models available for sale in Australia are known to comply with an overseas emission standard. It should be noted that detailed sales information was available for only 870 of the 1,200 (72%) of the products available for sale, with the survey report noting that the sampling method was likely to be biased towards products with good environmental performance.

Table 3.2 Garden engine type and compliance with overseas standards (Environment Link 2007 A)

Best standard achieved	2c[1]	4c[2]	Unknown[3]	All
1997 - US EPA	53	32		85 (10%)
2002 - EU	17			17 (2%)
2004 - US EPA	1	3		4 (<1%)
2004 - EURO	8			8 (1%)
2005 - US EPA	10	29	5	44 (5%)
2006 - US EPA	107	141	2	250 (29%)
2006 - EURO	6			6 (1%)
2007 - US EPA		1		1 (<1%)
2007 - EURO		2		2 (<1%)
None[4]	118	90		208 (24%)
Unspecified	24	60	161	245 (28%)
All	**344**	**358**	**168**	**870**

[1]2c: 2 stroke, carburettor
[2]4c: 4 stroke, carburettor
[3]Unknown, likely to be 2 stroke, carburettor
[4] Does not comply with any overseas standard

Victa is the only local manufacturer of garden equipment engines and produces the only two stroke lawn mowers available in Australia. Victa has undertaken research and development to reduce emissions from these engines and, in early 2007, released a new engine with 30% lower emissions than earlier models. However, it is understood that this engine still would not meet current US or European emission standards. In mid-2008, Victa was acquired by Briggs and Stratton, a US-based engine manufacturer. Production of Victa's two stroke engines in Australia is likely to continue, at least in the short term.

Briggs and Stratton (Australia) supply the majority of the four stroke engines for handheld equipment sold in Australia. These engines are imported from the US and comply with US and the more stringent California Air Resources Board (CARB) regulations.

3.1.2 Marine Equipment

There are more than 260 models of outboard engines and personal watercraft available for sale in Australia, not including sterndrive and inboard engines. There are no Australian manufacturers of outboard engines. The eight major brands of outboard engines and personal watercraft are imported by six distributors: Yamaha (Yamaha brand); Mercury Outboard (Mercury brand); BRP (Evinrude, Johnson and Seadoo brands); Honda (Honda brand); The Haines Group (Suzuki brand); and Lakeside Outboard (Tohatsu brand). All major brands include a full range of low emission engines. These brands account for 98% of Australian sales of outboard engines (Environment Link, 2007 B).

Until recently, the above Australian distributors comprised the Outboard Engines Distributors Association (OEDA), which was formed in 2006. In August 2009, BRP, Honda and The Haines Group broke away from OEDA to form a new distributor organisation, the Australian Outboard Engine Council (AMEC), which also includes representation from Volvo Penta, Yanmar, Skeeter and Torqeedo Electric outboard engines. Thus, there are now two principal organisations representing Australian distributors of marine engines and equipment.

Sail/Osprey (China) is a relatively new importer of small two stroke and four stroke outboard engines with a minor market share, which distributes its engines mainly through the internet. Information about the company and its products is limited and Sail/Osprey does not have any affiliation with either OEDA or AMEC.

In contrast to the garden engine and equipment industry, the marine engine and equipment industry supplied reasonably comprehensive sales information. Table 3.3 shows a breakdown of outboard engines and personal watercraft available on the Australian market in 2007, and their sales.

Table 3.3 Australian outboard and personal watercraft market (Environment Link, 2007 B)

Type	Ranges	Technology[1]
<u>Outboard engines</u> 9 brands 238 models Annual Aust sales: Approx 47,000	Engine power: 1kW to 200kW Engine displacement: 50cc to 2600cc Price: $799 - $30,888	2c: 89 models (37%) 2i: 4 models (2%) 2di: 30 models (13%) 4c: 55 models (23%) 4i: 60 models (25%)
<u>Personal Watercraft</u> 4 brands 23 models Annual Aust. sales: Approx 2,000	Engine power: 54kW to 160kW Engine displacement: 700cc to 1500cc Price: $10,900 -$17,000	2c: 3 models (13%) 2i: 4 models (17%) 4c: 2 models (9%) 4i: 14 models (61%)

[1]2c: 2 stroke, carburettor, 2i: 2 stroke, fuel injection, 2di: 2 stroke, direct injection
4c: 4 stroke, carburettor, 4i: 4 stroke, fuel injection

A survey of outboard engine models available in Australia, and their compliance with overseas standards, was conducted (Environment Link, 2007 B). Survey results showed that Australia falls behind other developed countries in its uptake of low emission outboard engines. Results from this survey are summarised in Table 3.4, which shows the estimated compliance of the models of outboard engines available on the Australian market with California Air Resources Board (CARB) and US requirements, where the US 2006 standards are treated as equivalent to CARB 1 star requirements.

Table 3.4 Outboard engine type and likely compliance with overseas standards (Environment Link 2007 B)

Standard	2 stroke carburettor	2 stroke fuel inj.	2 stroke direct inj.	4 stroke carburettor	4i fuel inj.	All
None	89	4	0	1	1	95
CARB 1 Star /USEPA 2006	0	0	0	0	0	0
CARB 2 Star	0	0	14	13	0	27
CARB 3 Star	0	0	16	41	59	116
Total	89	4	30	55	60	238
% CARB 2 Star or better	0	0	100%	98%	98%	60%

Table 3.4 shows that at least 60% of outboard engine models comply with some emission regulation and these are predominantly either four stroke or fuel-injected two stroke engines. No two stroke carburettor engines complied with any current regulations.

As for outboard engines, a survey of personal watercraft models available in Australia and their compliance with overseas standards was conducted. Results from this survey are summarised in Table 3.5, which identifies the estimated compliance of the models of personal watercraft available on the Australian market with CARB requirements, where US 2006 standards are treated as equivalent to CARB 1 star requirements (Environment Link, 2007 B).

Table 3.5 Personal watercraft type and likely compliance with overseas standards (Environment Link 2007 B)

Standard	2 stroke carburettor	2 stroke fuel inj.	4 stroke carburettor	4i fuel inj.	All
None	2	2			4
CARB 1 Star					0
CARB 2 Star		1		9	10
CARB 3 Star			2	3	5
Total	2	3	2	12	19
% CARB 2 Star or better	0%	33%	100%	100%	79%

Table 3.5 shows that no new two stroke carburetted personal watercraft sold in Australia meet US 2006/CARB 1 star standards, and that all four stroke engines are likely to comply with at least one overseas exhaust emission limit.

A similar analysis to that undertaken for outboard engines and personal watercraft was not possible for sterndrive and inboard engines, as reliable information on the number of relevant boats currently in use, or likely to come into use, could not be obtained. However, industry indicated that the proportion of sterndrive and inboard engines, as a component of the recreational marine industry, is small. Industry also confirmed that the large majority of sterndrive and inboard engines would comply with US standards because the additional incremental cost of high performance, low emission engines, as a proportion of the total cost of boating equipment, is much lower for sterndrive and inboard engines than for outboard engines (AMEC, Personal Communication).

3.2 Emissions Performance of Non-Road Spark Ignition Engines and Equipment

Non-road spark ignition engines, particularly conventional two stroke engines used in applications such as lawn mowers, outdoor handheld equipment, outboard engines and personal watercraft are high polluters relative to their engine size and usage. These engines also produce emissions in addition to exhaust gases that can impact on water and soil quality (Environment Link, 2007 A). For example, the California Air Resources Board estimates that a carbureted two stroke engine can emit up to 25 - 30% of its fuel unburned into the water or atmosphere, which is why high-emission engines are prohibited on some lakes in California (CAL Boating).

On an individual engine basis, even the better-performing non-road spark ignition engines and equipment emit disproportionately higher levels of air pollutants when compared against typical modern car engines. For example, one hour of operation of a brushcutter certified to US standards produces around the same emissions of air pollutants as ten cars, operated over the same period. Furthermore, engines that do not comply with US requirements are likely to produce around ten times more emissions than the best performing US certified engines (Environment Link, 2007 A).

A study was conducted to determine emissions from a selection of domestic petrol garden equipment engines available in Australia (DTA, 2008). A range of engines were selected, comprising models that were certified to US or European standards, and models not certified to these standards. Results from the test program showed that there were major differences in the emission performance of engines certified to overseas standards and uncertified engines. Overall, the certified engines tested in the study performed significantly better, as a class, than uncertified engines. The study concluded that there would be significant benefits in establishing emission standards for garden equipment engines in Australia.

3.3 Is Government Intervention Necessary?

3.3.1 Air quality in Australia and key management pressures

Ambient levels of ozone and particles are currently above or near national air quality standards in some of Australia's major urban centres. Additionally, health studies show that there are health impacts associated with exposure to these pollutants even at low levels. Health costs of air pollution in Australia are estimated to be in the order of $11.1 - $24.3 billion annually (with a mid-range estimate of $18 billion) as a result of mortality alone (AIHW, 2007 & Access Economics, 2008). Given that air pollution also contributes to morbidity, the real health costs of air pollution are likely to be significantly higher.

At the national level, new vehicle emission and fuel quality standards have had a major impact on controlling atmospheric levels of the major air pollutants. Vehicle manufacturers have utilised a range of technologies to comply with vehicle emission standards. These include catalysts, exhaust gas recirculation, particle traps, and carbon filters to limit evaporative emissions. Similarly, state and territory governments have established a range of measures to control emissions from industrial sources, including load based licensing and environmental controls on emissions. These measures have significantly reduced pollution from industrial sources (OECD, 2007).

However, there are pressures that will impact on further efforts to maintain and improve air quality. An increasing population, particularly in Australia's urban centres, will lead to an associated increase in motor vehicle use and energy consumption, while climate change will lead to higher ambient temperatures. These factors will result in higher background levels of PM and ozone and render the task of complying with national air quality standards for these pollutants much more difficult.

Although there have been major advances in vehicle technology and industrial pollution control measures, particularly over the last twenty years, there is limited scope to reduce emissions much further from these sectors through technological solutions. Therefore, to maintain and improve air quality, the focus will need to be on managing a range of smaller sources, including non-road spark ignition engines and equipment. Inventory data in Section 2.3 shows that these sources can be a major contributor to urban air pollution, particularly CO and VOC.

In early 2009, the Environment Protection and Heritage Council (EPHC) agreed on a National Emissions Reduction Framework to identify and progress national collaboration on actions to reduce air emissions. Issues to be considered under the

Framework when targeting a source for national action include the effectiveness of current management actions, i.e., whether there is "market failure", the scale of the problem (ie local or national), and the likely effectiveness of a consistent, national approach to addressing the problem. Application of the Framework confirmed that non-road spark ignition engines and equipment fulfil the requirements for national action.

A review of the Ambient Air Quality NEPM by the EPHC is currently underway. One of the issues being considered in the review is establishing an exposure reduction target for selected pollutants, similar to the approach adopted in Europe (NEPC, 2007). Under this approach, Australian jurisdictions would need to reduce ambient levels of a specified pollutant(s) by an agreed percentage, e.g., by 20%. Should this measure be agreed by EPHC, then action on non-road spark ignition engines and equipment will be a key element to deliver on meeting an exposure reduction target.

3.3.2 Comparison of the externalities of compliant and non-compliant engines

Non-road spark ignition engines and equipment, particularly at the cheaper end of the market, continue to employ relatively polluting technologies, such as carburetted two stroke, with little or no emission controls. As a result, non-road spark ignition engines and equipment are relatively highly-polluting sources, which are currently not controlled for air emissions in Australia (Environment Link, 2007 A&B).

An analysis was undertaken to assess the health costs arising from lifetime emissions arising from the use of a single unit of a specified non-road spark ignition engine or equipment in Australia. Health costs, or "externalities", were assessed for units compliant with overseas standards and non-compliant units. Engines and equipment assessed included the marine sector (outboard engines and personal watercraft) as well as the gardening equipment sector (lawn mowers, brush cutters, trimmers and hand held blowers). The full analysis is at Section 4.4 of Appendix 3.

The analysis showed that the externality costs for non-compliant units were much higher than those for units compliant with US standards.

In the case of marine engines and equipment, for which comprehensive data was supplied by OEDA, the difference in externality costs between compliant and non-compliant units was found to be over $9,000 per outboard engine and nearly $7,000 per personal watercraft. This is important because compliant outboard engines, on average, only cost around $3,000 more than non-compliant engines. This means that when externalities are accounted for, the social cost of non-compliant outboard engines exceeds that of compliant engines by more than $6,000, but the private cost is $3,000 less. This provides a distorted price signal to the outboard engine market and encourages socially inefficient market outcomes.

Similarly, the social cost of non-compliant personal watercraft is around $6,500 higher than the social cost of US standard compliant craft, but the private cost is $500 lower for non-compliant craft. Again, this distorts the personal watercraft market in favour of non-compliant units. While an accurate measure of the total externality value is difficult to assess, it was estimated that craft compliant with US 2006 emission standards still have an additional externality value equivalent to around

15% of the purchase price (assuming average usage over its lifespan). Thus, while compliance with US 2006 emission standards substantially reduces externality costs, the market price of a personal watercraft unit still remains sub-optimal from a social perspective.

For the gardening sector, the analysis of equipment prices indicates that the unit cost of equipment compliant with US 2006 emission standards is equal to unregulated engines, with average costs of $786 for lawn mowers, $567 for brush cutters, $737 for trimmers and $526 for blowers. This data is at odds with anecdotal evidence in Section 3.1 which indicates that sales of low-cost high-emission engines are increasing. However, it should be noted that the average equipment prices are based on a limited stock list. For some classes of engines, based on data supplied by OPEA, engines compliant with US standards were actually cheaper to purchase than their non-compliant counterparts. For example, only one four stroke brushcutter (Honda) was available, which was cheaper than many of the two stroke counterparts. However, this situation may not truly reflect the Australian brushcutter market.

The average costs of externalities associated with US 2006 standards-compliant units of equipment are approximately half those for the average of unregulated units for brush cutters, trimmers and blowers, and about 20% less for lawn mowers. Even engines compliant with US 2006 emission standards can give rise to external health costs of around 15 - 20 % of the recommended retail price. Therefore, the introduction of more stringent emission standards would reduce emissions even further and better address externality costs.

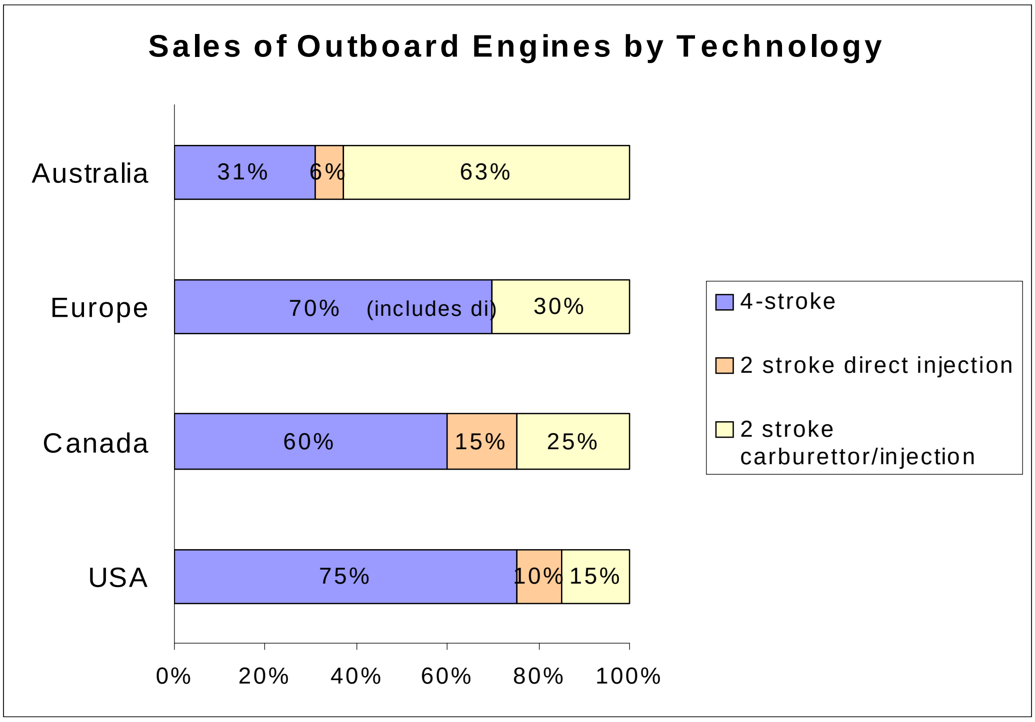
Analysis of the externality costs arising from an unregulated market for non-road spark ignition engines and equipment shows that a significant reduction in externalities would be achievable through regulating the market.

3.3.3 Influence of regulation on the market for non-road spark ignition engines and equipment

An analysis of outboard engines sold in 2005 in Europe, Canada and the US found that these jurisdictions had a high proportion of sales of low emission technologies, i.e., four stroke and direct injection two stroke engines – at least 70% (Figure 3.1). In contrast, Figure 3.1 shows that only 37% of outboard engine sales in Australia in 2005 were low emission technologies.

Europe, Canada and the US currently have regulations that limit emissions from non-road spark ignition engines and equipment to protect human health and the environment. There are no such controls in place in Australia, although Australia benefits to some extent from overseas regulations, as the Australian market includes engines that are also sold in Europe, Canada and the US. However, some manufacturers produce cheaper, higher emitting products for unregulated markets (Environment Link, 2007 A&B).

Figure 3.1 Comparison of Australian sales profile of outboard engines with regulated jurisdictions (Environment Link, 2007 B)



Australian consumers' preference for carburetted two stroke outboard engines, which would not comply with overseas emission standards, is most likely because these outboard engines are significantly cheaper to purchase than their four stroke counterparts (Environment Link, 2007 B).

The compliance status, with respect to overseas emission standards, of outboard engines and personal watercraft on the Australian market is summarised below (Environment Link, 2007 B):

- No new two stroke carburettor engines sold in Australia meet US 2006 emission standards
- 98% of four stroke engine and 98% fuel-injected two stroke engines are likely to comply with at least one exhaust emission limit (either USEPA, CARB or Europe)
- Around 60% of new outboard engine models on the Australian market meet CARB 2 or 3 star requirements. However, according to OEDA, sales of these engines amount to only 37% of total sales
- Australia lags behind other developed countries in its uptake of low emission outboard engines
- The number of brands and models of personal watercraft has reduced since 2004 and at least 65% of current models comply with CARB 2 or 3 star requirements.

A similar analysis for garden engines and equipment was not possible due to a lack of reliable information on the compliance status of these engines. However, OPEA members have expressed concern regarding the increasing sales of imported high polluting two stroke engines that do not meet any emission standards and come from countries that do not have emission standards. The increase in sales of two stroke handheld equipment, as shown in Table 3.1, provides some support for this view.

4. OBJECTIVES

The primary objective of government action is to:

1. Reduce the adverse impacts of non-road spark ignition engines and equipment on human health and the environment.

The secondary objectives of government action are to:

1. Reduce the adverse impacts of non-road spark ignition engines and equipment on climate change through reduced fuel usage.

2. Address information failures, so that consumers have ready access to information on the emissions performance of non-road spark ignition engines and equipment.

5. SELECTION OF FEASIBLE OPTIONS TO ACHIEVE OBJECTIVES

5.1 Summary of Options

This Section assesses a range of options for their feasibility in meeting the Objectives. Options are classified on the basis of (1) “Options for action”, i.e., actions to reduce emissions and (2) “Options to deliver emission standards”, i.e., mechanisms through which emission standards could be delivered.

Options for action

- Business as usual
- Limiting the use of non-road spark ignition engines and equipment
- Establishing emission standards

Options to deliver emission standards

- Voluntary industry agreement
- Individual state/territory-based regulations
- Commonwealth regulation
- National Environment Protection Measure (NEPM)

5.2 Options for Action

5.2.1 Business as Usual (BAU)

Under this option, emissions from non-road spark ignition engines and equipment would continue to be uncontrolled in Australia, noting that there are a proportion of non-road spark ignition engines and equipment sold into the Australian market that already comply with overseas standards. However, the benefits of overseas emissions standards would only be realised in cases where engines sold in Australia are the same as those sold into regulated markets, i.e., benefits are dependent on distributors not treating Australia as a “dumping ground” for non-compliant engines. The extent of this benefit, now and into the future, would therefore be determined by the decisions of the individual engine distributors.

In this context, a survey concluded that more than half the garden equipment engine models sold in Australia may not meet any overseas standards (see Table 3.2). The survey also indicated that sales of handheld garden equipment not meeting any standard were increasing (Environment Link, 2007 A).

In contrast, sales of high-emitting outboard engines are in decline in Australia, albeit slowly. High emission two stroke carburetted engines accounted for 63% of total sales in 2005, compared to 84% of total outboard sales in 1998. However, the majority of Australian outboard sales are still the cheaper, high-emission, two stroke engines in a market where more than 60% of models comply with overseas emission standards. This indicates that Australian consumers are more influenced by the purchase costs of outboard engines than environmental performance (Environment Link, 2008 B).

In the case of personal watercraft, the proportion of models that comply with an overseas standard is around 79%.

While the BAU option would not incur additional costs on industry or administrative costs on governments, it would not address the increased health and environmental impacts on the community of emissions from the poorer performing engines. The BAU option would also not guard against any future purchasing trends towards cheaper, high emission engines and equipment in an unregulated market.

The BAU scenario provides the baseline against which other options are compared in Section 7.

5.2.2 Limiting Use of Non-Road Spark Ignition Engines and Equipment

Inventory data from the NSW Department of the Environment and Climate Change indicates that emissions from non-road spark ignition engines and equipment can be disproportionately high during summer weekend days, when usage is high (PAE, 2005). Therefore, one option to reduce emissions is to place limitations on their use during summer. This could mirror, for example, the "odds and evens" systems utilised under water use restriction schemes that limit usage for individual households to every second day at a maximum.

However, non-road spark ignition engines and equipment for general domestic or recreational use are not used on a regular daily, or even weekly, basis in most cases. Therefore, it is doubtful that restricting the use of engines would have a meaningful impact on total emissions, even during summer. Enforcing such a regime would be very problematic, as well as costly. Furthermore, there would be no real way to determine the effectiveness of such a scheme.

This option is therefore not considered feasible to meet the Objectives and is not assessed further.

5.2.3 Establishing Emission Standards

Emission standards for non-road spark ignition engines and equipment have been in force in the US since 1995 and in Europe since 2003 (DieselNet, 2009). These standards limit emissions from non-road spark ignition engines and equipment to a specified ceiling, depending on the type of engine and pollutant.

A study of emissions from garden engines and equipment conducted by Diesel Test Australia found that garden engines and equipment that were certified to US standards produced significantly lower emissions, as a group, than uncertified engines and equipment (DTA, 2008). Establishing emission standards would ensure that engines available for sale would meet minimum environmental performance requirements, with Figure 3.1 highlighting the higher proportion of low-emission technologies purchased in countries that have regulated for emission controls.

Setting emission standards has resulted in major emissions reductions from motor vehicles (DEWHA, 2009). Assessments of emission standards for non-road spark ignition engines and equipment by the US EPA and the Commission of European

Communities concluded that setting emission standards is an effective way to reduce emissions from these engines in the US and Europe (US EPA, 2008 A & EC, 2006).

This option could meet the Objectives and is assessed further.

5.3 Options for Delivering Emission Standards

The assessment undertaken in Section 5.2 identifies that the establishment of emission standards is the only feasible way to reduce emissions from non-road spark ignition engines and equipment. This Section assesses the feasibility of various options to implement emission standards.

5.3.1 Voluntary Industry Agreement

A national voluntary emissions labelling scheme (VELS) was established by OEDA for the outboard engine industry in January 2007. The aim of VELS is to assist consumers in making an informed choice when purchasing an outboard engine. Personal watercraft, and sterndrive and inboard engines are not covered by VELS, and the marine industry has not indicated support for a voluntary approach to cover these engines and equipment.

Table 5.1 below summarises the VELS star rating scheme, which is similar to the California Air Resources Board (CARB) star rating system, as applied to engines of less than 4.3 kW power (OEDA, 2009). Star ratings are linked to emission limits.

Table 5.1 VELS Star Rating (OEDA, 2009)

Star Rating	Emission Performance	Engine Technology	Emissions Limit HC + NOx (g/kwH)
Zero Star	High emission	Older two-stroke	>250
One Star	Low emission	Most two-stroke	68.4 – 250
Two Stars	Very low emission	Some two-stroke direct injection and four-stroke	30 – 64.8
Three Stars	Ultra low emission	Most two-stroke direct injection and four-stroke	5 – 30
Four Stars	Super ultra low emission	For future technologies	<5

A labelling scheme could be strengthened by setting reduction targets for the sale of high emission engines, as a percentage of all engines sold. This approach could be feasible for outboard engines, given that there are a small number of outboard engine distributors and the major industry groups, AMEC and OEDA, represent around 98% of the market share of sales.

VELS could be further strengthened through governments working with the industry to provide better promotion and oversight of the scheme. Formalisation of a national voluntary approach could be implemented through a memorandum of understanding between the peak industry body(s) and governments.

In contrast to the outboard engine industry, the current market for garden equipment engines is much more diverse. OPEA has indicated that it would not support a voluntary approach, as it considers that it would not be possible to secure commitment from the industry as a whole for a voluntary scheme and, therefore, compliance with star ratings and sales targets would be minimal (OPEA, Personal Communication). Without industry support, a voluntary approach for managing emissions from garden equipment is unlikely to be any more effective at meeting the objectives than the business-as-usual base.

A voluntary approach is considered feasible to meet the Objectives for the outboard engine industry only and is assessed further in Section 7.

5.3.2 Individual State/Territory-Based Regulations

Emission standards could be established under state/territory-based regulation. This would allow those jurisdictions that consider non-road spark ignition engines and equipment to have a significant impact on their airsheds to implement regulation as they consider appropriate. This approach would have the benefit that regulatory costs could be borne by those jurisdictions that benefit the most from regulation.

Costs to businesses, especially those that trade in a number of jurisdictions, would be dependent on the form of regulation and how it is implemented. Costs could be quite high due to duplicative or inconsistent approaches and the need for industry to deal with more than one regulatory agency.

Under individual state/territory-based regulations, enforcement would predominantly take place at point of sale. Arguably this is a less efficient process, both in terms of administration and compliance, than enforcement at point of importation, as there are far fewer importation points than points of sale.

Industry would face costs associated with certifying, testing and registering engines in accordance with the standards. However, costs could be minimised if agreement was reached between governments for one nationally consistent set of requirements and one registration body. Additionally, acceptance of international test results would mean that engines would not need to be re-tested in Australia.

It is likely that only some jurisdictions would enact legislation and, even if all jurisdictions enacted legislation, there could remain some inconsistencies between jurisdictions. In the event of jurisdictional inconsistencies, jurisdictional regulation would be affected by the *Mutual Recognition Act 1992*, which allows goods that can be legally sold in an individual state or territory to be sold in another, regardless of any differences in standards or other sale-related regulatory requirements. Regulatory consistency could also be affected if compliance and enforcement regimes differ between states, even if all states enact identical legislation and regulations, and this could lead to varying requirements on businesses and varying environmental outcomes across jurisdictions.

State/territory-based regulation is considered unlikely to meet the Objectives and is not assessed further in this RIS.

5.3.3 Commonwealth Regulation

Establishing national emission standards through Commonwealth regulation would result in a nationally consistent approach. This would provide certainty to the market in that the same standards would apply in all jurisdictions and engine distributors would only need to register a product with one body and be certain that it could be sold anywhere in Australia.

Commonwealth regulation could be applied at the point of importation, manufacture or sale. A regulatory gap for Commonwealth regulation is that the Commonwealth does not have powers to enforce emission standards at the point of sale if the seller is an unincorporated entity selling entirely within one state. However, the vast majority – more than 90% of relevant engines – are imported. The only Australian manufacturer identified, Victa, is a major distributor that sells its engines across Australia. Therefore, the application of Commonwealth regulation at the point of importation and manufacture would enable complete coverage of the non-road spark ignition engine and equipment sector.

There is some possibility that the Commonwealth regulation option could be affected by the Trans Tasman Mutual Recognition Agreement (TTMRA), which allows for goods that can be sold legally in New Zealand to be sold in Australia, and vice versa. The practical application of the TTMRA in this case is that it only applies to goods being imported into Australia via New Zealand. Should this become an issue, it could be addressed through New Zealand adopting the same emission standards as Australia for non-road spark ignition engines and equipment, or through formal Australian/ New Zealand agreement to void TTMRA requirements as applied to these engines and equipment.

Commonwealth regulation of emissions could be achieved through instituting a system of controls on the manufacture and importation of engines. Compliance with emission standards would be demonstrated through certification in the same manner that the existing Australian Design Rules operate for motor vehicles. A database of certified products would be developed. Relevant products imported into Australia or distributed from a manufacturer would be checked against the certification database to ensure that they are compliant with emission standards.

As with setting standards through state regulation, either individually or under a NEPM, industry would face costs associated with certifying, testing and registering engines in accordance with the standards. However, costs would be minimised as there would be one nationally consistent set of requirements and one registration body. Additionally, acceptance of international test results would mean that engines would not need to be re-tested in Australia.

This option could meet the Objectives and is assessed further in Section 7.

5.3.4 National Environment Protection Measure

The National Environment Protection Council (NEPC) can develop and make National Environment Protection Measures (NEPMs). NEPMs, which are framework-setting instruments defined in the *National Environment Protection Council Act*

(1994), are similar to environmental protection policies. NEPMs set agreed national objectives for protecting or managing particular aspects of the environment. Implementation of NEPMs is outside the Council's jurisdiction and is achieved through state and territory legislation and associated regulations.

The NEPM framework offers the advantage of providing a collaborative process that includes all jurisdictions in the development of standards and implementation protocols. This could potentially allow for a nationally consistent framework for the setting, implementation and enforcement of standards.

As for Commonwealth regulation, establishing emission standards through a NEPM would overcome the mutual recognition issues associated with individual state/territory-based regulations, as all jurisdictions would establish identical standards. However, there is some possibility that the NEPM option could be affected by the Trans Tasman Mutual Recognition Agreement (TTMRA). Should this become an issue, it could be addressed through New Zealand adopting the same emission standards for non-road spark ignition engines and equipment as Australia, or through formal Australian/New Zealand agreement to void TTMRA requirements as applied to these engines and equipment.

There is potential for the implementation and enforcement of NEPMs to vary between jurisdictions. To give effect to the NEPM, jurisdictions would need to adopt NEPM provisions in their own regulations. As with individual state-based regulation, regulatory consistency could be affected if compliance and enforcement regimes differ between states, even if all states enact identical legislation and regulations, and this could lead to varying environmental outcomes.

Under state-based regulation established under a NEPM, enforcement would predominantly take place at point of sale. Arguably this is a less efficient process, both in terms of administration and compliance, than enforcement at point of importation, as there are far fewer importation points than points of sale.

As with setting standards through individual state-based regulation, industry would face costs associated with certifying, testing and registering engines in accordance with the standards. However, costs could be minimised if agreement was reached between governments for a nationally consistent set of requirements and one registration body. Additionally, acceptance of international test results would mean that engines would not need to be re-tested in Australia.

This option could meet the Objectives and will be assessed further in Section 7.

6. EMISSION STANDARDS - PROPOSED MODEL FOR ADOPTION AND PARAMETERS FOR ANALYSIS

6.1 Introduction

Section 5.2 concluded that establishing emission standards is the only feasible means to achieve the Objectives.

This Section outlines the emission standards proposed for adoption in Australia, the rationale behind their selection and the key differences in the way emissions standards are implemented in the US and the implementation approach proposed for Australia.

6.2 Harmonisation with Overseas Emission Standards

6.2.1 Why US Emission Standards?

As a technology taker, Australia has made a conscious decision to harmonise vehicle emissions standards with those followed internationally. Accordingly, this analysis assumes that should Australia choose to regulate emissions from non-road spark ignition engines and equipment, this is best implemented through the adoption of relevant US emission standards, as these form the basis of a number of international standards, including those in Europe and Canada.

The adoption of US standards is supported by the great majority of Australian distributors of non-road spark ignition engines and equipment, as they are familiar with the requirements of the United States Environment Protection Agency (US EPA) compliance regime.

The emission standards proposed for adoption in Australia are those specified in the *US EPA 40 CFR Parts 9, 60, 80 et al Control of Emissions from Nonroad Spark Ignition Engines and Equipment; Final Rule*, which was promulgated by the US EPA in October 2008 and is hence referred to in this RIS as the “US Final Rule”. The US Final Rule contains the most recent US exhaust and evaporative emission standards, which are based on environmental performance achievable through the use of currently available pollution control technologies (US EPA, 2008 B).

A summary of US emission standards under the US Final Rule, the engines to which they apply and their implementation dates in the US, is at Appendix 1.

6.2.2 Engines and Equipment Covered by US Emission Standards

Table 6.1 sets out the non-road spark ignition engines and equipment covered under proposed Australian emission standards. These non-road spark ignition and equipment are identical to those regulated under the US Final Rule.

Table 6.1 Non-road spark ignition engines and equipment covered under proposed regulation

Garden Engines and Equipment	
Small spark ignition non-handheld equipment < 225 cm^3 capacity	e.g. Walk behind lawn mowers, Small electrical generators, Pressure washers
Small spark ignition non-handheld equipment ≥225 cm^3 capacity	e.g. Ride-on mowers, Zero-turn mowers, Larger electrical generators
Small spark ignition handheld equipment	e.g. Line trimmers, Edgers, Leaf blowers, Chainsaws
Marine Engines and Equipment	
Outboard engines Personal watercraft Sterndrive engines Inboard engines	

6.2.3 Proposed Implementation of US Emission Standards in Australia

There are a number of key differences in the way emission standards for non-road spark ignition engines and equipment are implemented under the US Final Rule, and the proposed implementation approach for Australia:

- The proposed introduction date for exhaust and evaporative emissions standards in Australia is 2012.
  - US Final Rule emission standards have various introduction dates, beginning in 2009 (see Appendix 1).
  - It is proposed that at no time will Australia have in place emission standards that are more stringent than those in place at that time in the US. This will ensure that manufacturers and distributors of relevant engines will not be subject to unnecessary regulatory and administrative burdens beyond compliance with the US Final Rule standards. A comparison of US Final Rule and Australian implementation timetables is at Appendix 1.
- Averaging, banking and trading are not proposed as part of the Australian compliance regime. The rationale for this approach is explained below.

The US Final Rule makes provision for averaging, banking and trading (ABT). Under ABT provisions, manufacturers can average emissions across product families within their product lines and can use credits accrued in one year for engines that outperform standards to offset worse-performing engines in subsequent years. Manufacturers can trade credits so long as the product line, on average, does not exceed the weighted average, as allowed by standards, for the relevant product line.

Under the ABT system operating in the US, exported engines do not count towards calculating an average emission factor for each manufacturer, as ABT only applies to domestic sales. Therefore, US manufacturers could sell all their high-emission engines and equipment in Australia without incurring an emissions debit penalty in the US.

Some Australian distributors of garden equipment support the adoption of ABT in Australia on the basis that it will allow them to maintain a supply of high emission equipment for niche applications, such as olive shakers, which cannot be serviced with standards-compliant equipment. Without ABT, the use of high-emission equipment for niche applications could be addressed through distributors seeking approval to supply such equipment for specified purposes.

The adoption of US emission standards in Australia without ABT would allow for the maximum environmental benefits from US emission standards in Australia and Australian emission standards would, effectively, be more stringent than those in the US. Disallowing ABT would reduce the number of models available on the Australian market, and reduce consumer choice, as manufacturers could only distribute those models that comply with US Final Rule emission standards without resorting to averaging emissions over the manufacturers' range of relevant engines.

An alternative approach is for Australia to establish its own ABT scheme. However, a domestic ABT system would be onerous to administer and take some time to establish, as detailed sales and emission data for relevant engines and equipment would need to be collected and processed for the Australian market.

For the reasons outlined above, it is not proposed that ABT is adopted in Australia.

7. IMPACT ANALYSIS OF FEASIBLE OPTIONS

7.1 Introduction

Section 5 concluded that establishing emission standards was the only feasible way to meet the Objectives, and identified the following options as being feasible delivery mechanisms to establish emission standards:

1. A voluntary outboard industry agreement
2. Commonwealth regulation to establish emission standards
3. National Environment Protection Measure (NEPM) to establish emission standards

This Section assesses the impacts of these options in delivering emission standards.

7.2 Impact Analysis Methodology and Key Assumptions

The findings in this Section are based on the analyses conducted by McLennan Magasinik and Associates (MMA):

- *Cost Benefit Analysis of Options to Manage Emissions from Selected Non-Road Engines (August 2008)*
- *Cost Benefit Analysis of Options to Manage Emissions from Selected Non-Road Engines: Additional Scenarios (November 2009)*

A summary of the policy scenarios assessed for impacts is at Appendix 2. Reports of the above analyses are at Appendices 3 and 4, respectively. The method for assessing costs and benefits is set out in Section 3 of Appendix 1. The estimates provided throughout this analysis are aggregated at the level of sectors (marine outboard, personal watercraft, inboard and sterndrive, and gardening equipment). A Business as Usual (BAU) scenario was developed and used as a benchmark against which the policy options were compared. Each policy option was modelled as a perturbation of the BAU scenario; specifically, the stock of engines available for sale in each year was changed. This in turn changed the numbers of different types of engines operating in the economy and, therefore, the costs and emissions associated with them in each year relative to BAU. The key steps and underlying assumptions in the assessment follow and these are explained in detail in Section 3.2 at Appendix 3:

1. *Estimate the sales of engines of each type in each year.* Sales were based on historic sales figures and were fore- and back-casted based on population levels. Sales are estimated for the years 1990 to 2030.

   For marine engines, historic sales data of outboard engines and personal watercraft from 1998 to 2007 for each technology (2c, 2i, 4c and 4i) were compiled, based on information supplied by the marine engine industry.

   For garden engines, sales data supplied by the garden engine industry was compiled in fundamentally the same way as for marine engines. However, matching engines available in Australia against US EPA emissions test data proved difficult and hence the stock list comprised representative engines for each class of engine (see Appendix 1) and usage. Equipment assessed were walk behind lawn mowers, brushcutters, hand held blowers and hedge trimmers. Equipment excluded from the assessment were chainsaws, ride-on mowers and wheeled blowed, as it was not possible to obtain a list of the models of these equipment, nor was it possible to obtain reliable data on the compliance status of these equipment.

2. *Estimate the number and age profile of the stock of engines in service in each year*. The stock of engines in a given year is the sum of sales in that year and engines sold in previous years that have not been scrapped. Applying a “scrapping” function to a given engine type provides the number and age profile of each engine type in each year. This method ‘accumulates’ engines sold in the current and all previous years. For this reason, the collection of sales data commenced from 1990 – to build up a ‘representative’ stock of engines for use in 2009 and beyond.

3. *For each year, estimate:*
   a) the value of sales – based on base price and inflation
   b) the emissions:
     - *Particulate matter (PM)*
     - *Nitrogen oxides (NOx)*
     - *Volatile organic compounds (VOC)*
     - *Carbon monoxide (CO)*

   c) the amount of fuel consumed
   d) servicing costs

   The value of sales was based on purchase price and sales numbers data supplied by the representative bodies for the marine and garden engine sectors, OEDA and OPEA. Purchase price data used to estimate impacts arising from marine engines and equipment were based on reasonably comprehensive data supplied by the marine industry. Purchase price data used to estimate impacts from garden engines and equipment, however, were based on limited data supplied by the garden equipment industry, and may be less reliable than for the marine sector. The impact analysis assumed that the purchase price of compliant garden equipment is the same as non-compliant garden equipment. As noted in Section 3.3.2, this assumption is in contrast to anecdotal evidence suggesting that non-compliant garden equipment is cheaper than compliant equipment.

   Emissions from each engine type in a given year, and fuel usage, were estimated through consideration of engine age, capacity, annual usage and average load. Emissions and fuel consumption were calculated using relevant US EPA emission factors, fuel consumption factors and deterioration factors (USEPA, 2005 A & B). The total emissions arising from the entire stock of engines was the aggregate of emissions from each individual engine.

   For the marine engine sector, an emission factor for non-compliant engines was developed through averaging emissions from all non-compliant engines in the dataset.

Servicing costs were based on expert opinion.

4. *For each year, estimate the costs and benefits arising from the use of the stock of engines*. Emissions estimates developed through Step 3 were used to calculate nominal costs and benefits for each scenario. The costs were calculated using data from health studies, which reported costs in dollars per tonne of emissions.

   It was assumed that there is a linear relationship between the tonnage of emissions for each pollutant and health impacts and that health impacts arising from non-road engine and equipment emissions are not dependent on the background level of pollution e.g., the likely disproportionate nature of emissions, skewed towards weekends, does not influence the health response to each tonne of pollutant. This assumption is reasonable, as the pollutants for which health impacts were assessed are 'non-threshold' pollutants, i.e., these pollutants do not have a threshold below which health impacts have not been observed.

Table 7.1 Pollution costs per tonne (2008 AU$)

	NOx	HC	CO	$PM_{2.5}$	PM_{10}
BTRE high	PM_{10} used as a surrogate for all air pollutants in BTRE study				324,000
BTRE medium					229,738
BTRE low					136,068
EC land - high	22,497	5,249	Not estimated	140,608	Not estimated
EC land - low	8,249	1,781		48,744	
Best Estimate (EC composite)	**13,592**	**3,356**		**82,490**	
EC sea - high	12,936	4,312		67,492	
EC sea - low	4,686	1,462		24,372	
VTPI - high	19,510	18,244	550	$PM_{2.5}$ is a subset of PM_{10}	11,940
VTPI - medium	14,182	11,341	550		9,352
VTPI - low	8,854	4,438	550		6,765

The impacts of emissions are directly related to the population size exposed to emissions, and a proportion of emissions from non-road engines and equipment will impact on relatively unpopulated areas where impacts are relatively minor. In determining the health impacts for each tonne of pollutant (PM, NOx and VOC), mid-level estimates for these pollutants ("EC composite" estimates in Table 7.1), derived from the European Commission air pollution damage estimates, were used, with the impacts-per-tonne adjusted for the lower Australian population density compared with European cities. The range of health cost estimates for each pollutant assessed in the impact analysis is set out in Table 7.1.

Health impacts of exposure to PM, NOx and VOC took into account emissions into the sea and on land, to develop a composite emissions profile. The methodology used to develop estimates of the impacts per tonne of specified pollutant (PM, NOx and VOC) is consistent with the methodology undertaken by the US EPA in their impact analysis for non-road spark ignition engines and equipment (US EPA, 2008A). Further explanation of these costs is set out in Section 3.5 of Appendix 3.

5. *Discount the annual costs back to 2008.* The time series for each of the costs listed in Step 3 were discounted using a nominal interest rate of 7% to obtain the net present value (NPV) of costs in 2008. This discount rate is identical to the rate used by the US EPA in their impact analysis for non-road spark ignition engines and equipment (US EPA, 2008A).
6. *Calculate the costs and benefits of a given regulation.* Costs discounted to 2008 were calculated for different scenarios, including business as usual (BAU), by differencing. In this context, a given scenario is defined as showing a cost if the 2008 NPV is less than BAU, while the converse applies to a scenario benefit, i.e., the 2008 NPV is greater than BAU. Using this methodology, costs and benefits can be considered for individual components (e.g. fuel consumption).

To ensure that stock had time to turn over and to take into account time lagged benefits, the sales in each scenario were run to 2030. However, the model tracks emissions and costs up until 2050 to account for the long lifetime of engines and equipment.

The various scenarios were modelled as changes to the stocks of engines available for sale under the BAU in each year. This is the only aspect of the market affected by any of the regulations modelled in this study.

Changes in purchasing patterns were reflected by incorporating demand side elasticities. It was assumed that, since the Australian market is small compared to the global market, Australia is a price taker and hence supply side elasticities were ignored (i.e. regulation in Australia is not going to affect the production cost and supply price of engines).

7.3 US Emission Standards – Parameters for Impact Analysis

Due to data limitations, it was not possible to assess the impacts of the entire suite of US Final Rule standards proposed for adoption in Australia. The key differences between the standards assessed for impacts in Section 7 and standards proposed for adoption in Australia are summarised below:

- For garden equipment, only the avoided emissions from lawn mowers, hedge trimmers, brush cutters and hand held blowers were assessed for impacts, rather than the full suite of engines and equipment targeted for regulation.

- For garden engines and equipment, the impacts of introducing the US 2006 exhaust emission standards were assessed, rather than the more stringent US Final Rule exhaust emission standards.

- For sterndrive and inboard engines, the impacts of introducing US Final Rule exhaust and evaporative emission standards were not assessed.

The influence of the above parameters on the impact analysis of options to meet the Objectives is discussed in Section 7.7.

7.4 Voluntary Outboard Industry Agreement

7.4.1 Outline of Option

This option assumes a voluntary agreement within the outboard industry to reduce sales of higher emission engines over time. In this context, high-emission engines are defined as those that achieve a zero or one star rating under the OEDA Voluntary Emissions Labelling Scheme (VELS), which are identical to CARB zero and one star ratings, as set out in Section 5.3.1.

A voluntary approach is unlikely to meet the objectives without a sales target for high emission engines, as these engines comprise the majority of outboard engines sold (Environment Link, 2007 B). Therefore, both policy scenarios assessed included a sales target of 15% for high-emission engines.

Table 7.2 sets out the two policy scenarios that were assessed for this option:

Table 7.2 Policy scenarios for a voluntary outboard industry agreement (IA)

Scenario name	Engines covered and approach	Scenario description
IA-1	Outboard engines Sales target met by 2012	Full compliance by 2012, with a linear decrease in the sale of high-emission engines to 15% of market share
IA-2	Outboard engines Sales target met by 2020	Full compliance by 2020, with a linear decrease in the sale of high-emission engines to 15% of market share

7.3.2 Assessment of Costs and Benefits

Table 7.3 shows that the net present value (NPV) of restricting the sale of higher emitting outboard engines to 15% by 2012 through a voluntary industry agreement is estimated to be around $1,195 million. If the same 15% target is achieved by 2020, the NPV estimate falls to $580 million.

Table 7.3 Policy scenarios and net present value (2008 $million) to 2030 for a voluntary outboard industry agreement

Scenario name	NPV
IA-1	1,195
IA-2	580

There is doubt, however, that the above sales targets can realistically be achieved. Feedback from AMEC members indicates that VELS has had little influence to date in influencing consumer behaviour for purchasing outboard engines at the lower end of the market. They cite that the two main reasons why this is the case are that only around 20% of outboard engines sold are labelled effectively, and that cost is the major consideration in deciding which outboard engine to buy. AMEC estimates that since VELS was introduced in January 2007, cheaper high emission engines still constitute around 70% of sales for the <15 horsepower engine market (AMEC, Personal Communication).

With the exception of the Australian VELS scheme, there is no working example of a voluntary industry agreement anywhere in the world aimed at encouraging sales of low emission outboard engines, and there is little indication that such a scheme would be effective in Australia. An analysis of the likely effectiveness of a voluntary industry agreement as applied to Minimum Energy Performance Standards (MEPS) concluded that such an agreement is unlikely to be effective for products covered by the MEPS scheme (George Wilkenfeld and Associates, 2000).

The MEPS analysis also showed that, even if a voluntary program could be implemented successfully, with a good outcome for competition and consumer choice, the cost of a voluntary program would be much higher than for a mandatory scheme. Furthermore, under voluntary implementation, the outcome would be uncertain for several years, so the risk that the program would fail to deliver on environmental objectives would be high (George Wilkenfeld and Associates, 2000).

7.4.3 Affected Parties

State/Territory Government Agencies

A voluntary scheme for outboard engines would have minimal impacts on state and territory agencies, as the scheme would be administered by the industry.

Outboard Engine Industry

Administration of a voluntary labelling scheme for outboard engines will entail some administration costs for the outboard engine industry. There would also be additional costs to manufacturers associated with the production of a higher proportion of low-emission outboard engines, particularly if a sales target for such engines is adopted. These costs would be passed on to consumers. It should be noted that VELS is not supported by AMEC, which comprises a significant component of the outboard industry. However, the remaining members of OEDA still support VELS.

Consumers

Consumers would not be impacted by a voluntary labelling scheme through the higher purchase costs of low-emission outboard engines, as they still can choose to purchase cheaper, high-emission engines. However, consumers purchasing low-emission engines would enjoy the benefits of engines with better fuel efficiency characteristics, which could, over time, negate their higher capital costs. Four stroke and direct-injection low-emission technologies also offer convenience to users of outboard engines in that oil and petrol do not have to be blended by the boat user prior to outboard operation, as for carburetted two-stroke engines.

7.5 Commonwealth Regulation

7.5.1 Outline of Option

This option would require the enactment of new legislation to establish emission standards, as appropriate Commonwealth legislation is not in place. Commonwealth regulation would apply to all new non-road spark ignition engines and equipment sold into the Australian market and would restrict emissions from these engines through the implementation of US exhaust and evaporative emission standards.

7.5.2 Assessment of Costs and Benefits

Table 7.4 summarises the policy scenarios assessed for establishing and implementing US standards through Commonwealth regulation.

Table 7.4 Policy scenarios for Commonwealth regulation

Scenario name	Engines/equipment covered and approach[1]	Scenario description
OB-1a	Outboard Engines Non-phased	US Final Rule outboard exhaust and evaporative emission standards implemented in Australia from 2012.
OB-2a	Outboard Engines Phased	US 2006 outboard exhaust emission standards implemented in Australia from 2012, with US Final Rule exhaust and evaporative emissions standards implemented in Australia from 2015.
PWC-1a	Personal Watercraft Non-phased	US Final Rule personal watercraft exhaust and evaporative emission standards implemented in Australia from 2012.
PWC-2a	Personal Watercraft Phased	US 2006 personal watercraft exhaust emission standards implemented in Australia from 2012, with US Final Rule exhaust and evaporative emissions standards implemented in Australia from 2015.
Grd-1a[2]	Garden Equipment Non-phased	US 2006 gardening equipment exhaust emission implemented in Australia from 2012, with US Final Rule gardening equipment evaporative emission standards implemented in Australia from 2012.
Grd-2a[2]	Garden Equipment Phased	US 2006 gardening equipment emission standards implemented in Australia from 2012 with US Final Rule gardening equipment evaporative emissions standards implemented in Australia from 2015.

The OB-1a, PWC-1a and Grd-1a scenarios are "non-phased" (one-step) approaches, representing the earliest practicable timetable for implementing national standards for outboard engines, personal watercraft and garden equipment, respectively, taking into account Commonwealth legislative processes.

The OB-2a and PWC-2a scenarios are "phased" (two-step) approaches, for which implementation of US Final Rule exhaust standards for outboard engines and personal watercraft is delayed until 2015, with US 2006 standards to apply from 2012 to 2015. A phased approach allows those industries with higher-emission products (i.e. products that comply with US 2006 standards, but not Final Rule standards) additional time and flexibility to adjust their product lines to comply with more stringent standards, while continuing to sell higher-emission products during the phasing period. A phased approach, however, delays the benefits of more stringent emission standards.

[1] "Non-phased" and "phased" refers to one- and two-step implementation approaches, respectively
[2] For gardening equipment, only avoided emissions from lawn mowers, hedge trimmers, brush cutters and hand held blowers were assessed.

The phased scenarios were assessed at the request of the International Council of Marine Industry Associations (ICOMIA), which represents the interests of a number of marine engine and equipment manufacturers in the US and Europe.

ICOMIA indicated that the delay in introducing more stringent standards would have negligible impacts on community health and could enhance the commercial viability of engine manufacturers (ICOMIA, Personal Communication).

The impacts of delaying the introduction of garden equipment evaporative standards until 2015 (scenario Grd-2a) were also assessed for comparative purposes.

A detailed breakdown of costs and net present value (NPV) associated with each Commonwealth regulation scenario, compared against business as usual, is shown in Table 7.5.

Table 7.5 Net present value to 2030 of costs for Commonwealth regulation scenarios (2008 $million), assuming implementation in 2012

Option	Scenario name	Service costs	Expenditure costs	Fuel costs	Health costs	Total costs	NPV
Business as Usual	OB-BAU	2,606	4,873	3,938	3,544	14,961	-
	PWC-BAU	97	316	281	139	834	-
	Grd-BAU	1,610	7,818	7,203	1,713	18,344	-
Policy Scenarios	OB-1a	2,461	4,635	3,441	2,221	12,759	2,202
	OB-2a	2,457	4,639	3,451	2,246	12,793	2,167
	PWC-1a	92	308	251	83	734	99
	PWC-2a	92	307	252	85	737	97
	Grd-1a	1,670	7,997	6,773	1,212	17,651	692
	Grd-2a	1,670	7,992	6,773	1,223	17,658	686

Table 7.6 summarises the NPV of Commonwealth regulation options for the non-phased and phased combinations of scenarios.

Table 7.6 Net present value to 2030 of costs for Commonwealth regulation scenario combinations (2008 $million)

Non-Phased OB-1a + PWC-1a + Grd-1a	Phased OB-2a + PWC-2a + Grd-2a
2,202 + 99 + 692 = 2,993	2,167 + 97 + 686 = 2,950

Table 7.5 shows that implementing emission standards through Commonwealth regulation will result in a NPV of $2,993 million for the non-phased combination of scenarios and $2,950 million for the phased combination of scenarios. Costs to industry associated with meeting the more stringent Final Rule standards earlier through a non-phased approach, when compared against a phased approach, were not quantified in the impact analysis – only the additional benefits were quantified. Manufacturers and distributors that currently market a high proportion of engines and equipment not compliant with US Final Rule standards could be advantaged under a phased approach, as costs associated with manufacturing and procuring compliant engines could be deferred. A phased approach would not advantage manufacturers and distributors of currently compliant engines and equipment.

The impacts of accelerating and delaying the implementation of national emission standards are shown in Table 7.7, with the base year for implementation set at 2012.

Table 7.7 Net present value to 2030 of costs of delaying implementation of US emission standards in Australia (2008 $million), with base year 2012

Start year	NPV				
	Outboard Engines	**Personal Watercraft**	**Garden**	**Total**	**Delay Costs (cumulative)**
2010	2,641	117	768	3,526	-533
2011	2,414	108	729	3,252	-274
2012	2,202	99	692	2,992	0
2013	2,002	91	653	2,747	246
2014	1,815	84	615	2,514	479
2015	1,640	77	576	2,294	700
2016	1,476	70	538	2,085	909

An assessment of NPV for implementing standards in 2010 and 2011 was included for illustrative purposes only, as these implementation dates are not considered to be practicable. Table 7.7 shows that implementing national standards in 2010 would lead to around $533 million in additional avoided health costs, when compared against implementation in 2012. Delaying implementation will lead to around $250 million in foregone benefits for each year standards are delayed beyond 2012.

7.5.3 Affected Parties

Commonwealth Government

The Commonwealth Government would need to develop new legislation, along with associated regulations, to give effect to US standards, as there is no suitable legislation currently in place. An assessment of previous legislative development processes indicates that the time needed to develop appropriate legislation is in the order of two years. Therefore, if approval for Commonwealth regulation is secured in 2010, legislation and associated regulations could be in place by 2012. This timeline takes into account Commonwealth government legislative processes and assumes no major delays.

A similar scheme to that proposed for non-road spark ignition engines and equipment, where product standards are enforced at the point of manufacture and importation, is administered under the Ozone Protection and Synthetic Greenhouse Gas Management (OPSGM) Act (1989) and related Acts. Compliance costs for the OPSGM Act are around $1 million per annum. These costs include enforcement of regulations at the point of manufacture and importation, and regular audits at point of sale, including testing. Given the similar size of the OPSGM market, it is reasonable to assume that similar costs would be applicable to regulating non-road spark ignition engines and equipment.

State/Territory Government Agencies

The impact on state and territory governments would be minimal, with jurisdictional costs limited to educating the public and distributors about emission standards.

Garden and Marine Engine Industries

Under Commonwealth regulation, there would be no trade restriction issues, as a single national standard would apply at the same time in all Australian jurisdictions.

It is not expected that manufacturers or distributors that currently sell relevant engines and equipment in other regulated markets would incur significant additional compliance costs. Distributors that do not currently sell engines and equipment in regulated markets may incur additional compliance costs, including emissions testing and administrative costs. If the Commonwealth Government undertakes full cost recovery of administrative costs, and this cost is split 3:1 between the garden and marine engine sectors (based on the relative numbers of models currently available in each sector), it is estimated that the garden and marine engine industries would be faced with around $750,000 and $250,000 compliance costs per annum, respectively.

Additional costs of producing engines and equipment, including fuel management systems, compliant with new Australian standards are likely to be minimal for the large majority of manufacturers for the Australian market, as engines will need to meet identical standards in the North America and the European Union. Manufacturers currently producing engines for unregulated markets are likely to be faced with re-engineering costs. Those suppliers with higher numbers of non-complying models will need to spend more on product testing and improvement than those with few or no non-complying models. Therefore, the cost impacts will fall on suppliers of high emission products.

As noted in Section 3.1.1, Victa is currently the only local manufacturers of garden engines and these are predominantly carburetted two stroke engines. Therefore, Victa would be faced with retooling costs if they wish to continue to manufacture relevant engines and equipment in Australia. However, given that Victa is now wholly owned by Briggs and Stratton, which supplies the bulk of four stroke engines for Australian garden equipment, the transition to manufacturing compliant engines by Victa should be greatly facilitated.

Establishing national emission standards would enhance competition by helping to overcome information failure. The emissions performance of all relevant products available for sale in Australia and determined for performance under the same test criteria (US Final Rule test procedures) could be made available to the public, for example, through the Living Greener government website. Products will thus be comparable on a consistent basis.

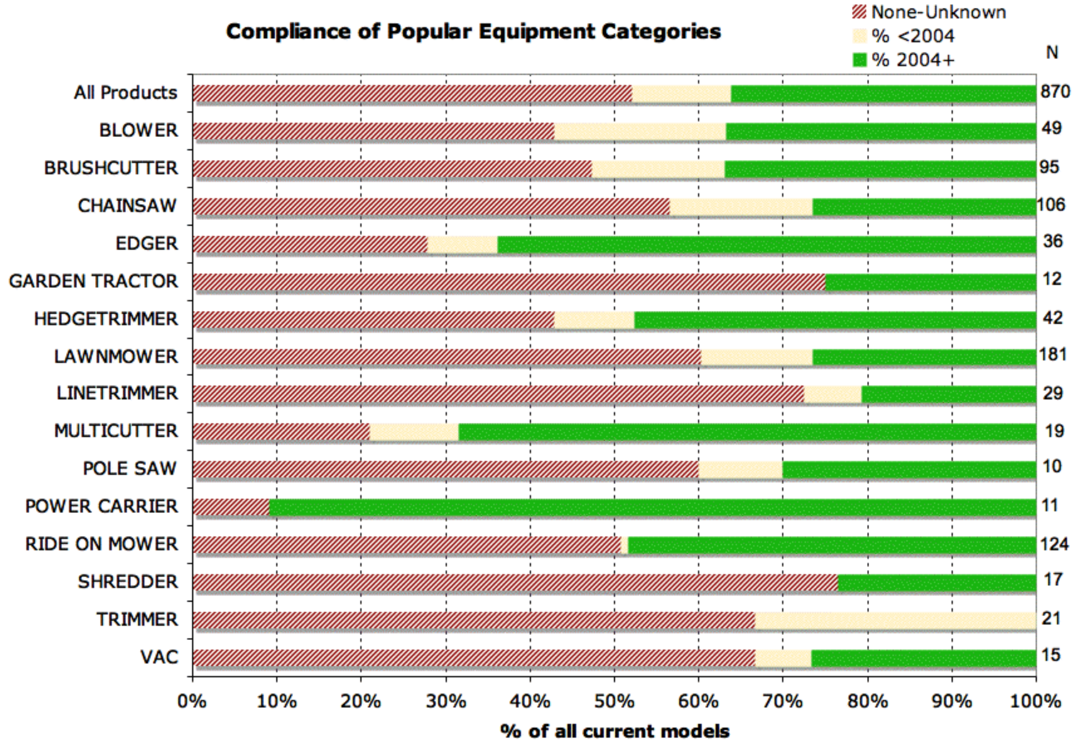
Consumers

Consumers will face higher costs and a reduced range of engine models as cheaper, high-emission, technologies, predominantly two stroke carburetted (2c), will not be legally obtainable. These include 2c outboard engines, which are currently available from most major distributors, and 2c carburetted garden equipment, generally purchased through the smaller retail outlets and through the internet, e.g., eBay.

In the case of marine engines and equipment, consumers will face higher purchasing costs and reduced range of models for outboard motors, particularly those under 15 horsepower, as these products are predominantly 2c technologies at present. Costs and product range for personal watercraft, and sterndrive and inboard engines are unlikely to be greatly affected, as these products already comply, to a large degree, with current US emission standards. There will be additional costs, however, associated with complying with new fuel systems needed to meet Final Rule evaporative emission standards, for all marine engines and equipment.

In the case of garden engines and equipment, consumers may face higher purchasing costs and a reduced range for leaf blowers, brushcutters, chainsaws, hedge trimmers, line trimmers, multicutters, pole saws and trimmers, as these products are predominantly 2c technologies at present. Figure 7.1 shows the compliance status of garden equipment for a number of categories, in terms of the number of models available in Australia and their compliance with older US emission standards.

Figure 7.1 Garden equipment compliance with overseas standards (Environment Link 2007 A)[1]



[1]"Pre 2004" means the engine complies with US EPA phase 1 or 2002.88.EU
"2004+" means the engine complies with US EPA Phase 2, Euro I or Euro 2
"Unknown" means that compliance with a standard was not provided

Figure 7.1 shows that, with the exception of edgers, multicutters and power carriers, Australian garden equipment is generally not compliant with US 2006 (Phase 2) emission standards. Of the equipment that complies with US 2006 standards, it is likely that some of these would not comply with the more stringent US Final Rule standards. This equipment would no longer be available for purchase in Australia. However, it is likely that a regulated environment will lead to an increased range of compliant equipment, in comparison with an unregulated market. As noted in Section 3.1.1, the data is likely to be biased towards products with good environmental performance. As engine emissions are not known to be associated with other desirable product design features, it is unlikely that regulation will exclude products from the market on any basis other than emissions performance.

As stated in Section 3.3.2, compliant outboard engines, on average, cost around $3,000 more than non-compliant engines, compliant personal watercraft cost around $500 more than non-compliant engines, while compliant garden equipment engines cost around the same as non-compliant engines. Consumers will also face higher purchasing costs for more efficient fuel management systems, which will be needed to meet new evaporative emission standards. However, consumers will also benefit from lower fuel consumption due to the higher efficiency of the new engine technologies and fuel management systems. This is difficult to quantify as it will depend on the size of the engine, application and hours of operation. Indicative fuel savings for the various policy scenarios are shown in Table 7.5.

Technologies that are likely to be compliant with US emission standards, such as four stroke and direct-injection low-emission technologies, also offer convenience to users of outboard engines in that oil and petrol do not have to be blended by the boat user prior to outboard operation, as for carburetted two-stroke engines.

The National Marine Safety Committee (NMSC) has indicated there may be safety issues associated with mandating for low-emission technologies such as two stroke direct injection and four stroke engines, which may restrict sales of traditional high-emission carbureted two stroke engines. NMSC has claimed that the boats which use engines of less than 50 horse power may not be positively buoyant when replacing an existing high-emission engine with a modern low-emission engine of equivalent power. This claim is based upon the premise that low-emission engines in this class are heavier than their traditional high-emission carbureted two-stroke counterparts (NSMC, Personal Communication).

Feedback from a number of manufacturers indicates that some modern low-emission engines can be lighter than equivalent high-emission traditional carburetted two-stroke engines and there is no safety issue associated with the use of modern low-emission engines in such boats (AMEC, Personal Communication).

Standards Australia, in 2009, released a new power boat Standard: *AS1799.1 Small Craft – General Requirements for Power Boats*. The Standard includes new buoyancy requirements and increased outboard engine mass specifications that will accommodate current engine designs (Standards Australia, 2009).

7.6 National Environment Protection Measure

7.6.1 Outline of Option

Under this option, a NEPM would be developed under the *National Environment Protection Council Act 1994*, which would establish US emissions standards for new non-road spark ignition engines and equipment being sold into the market.

Implementation would be achieved through each state and territory adopting the NEPM provisions under their own legislation.

7.6.2 Assessment of Costs and Benefits

The policy scenarios for establishing national emission standards under the NEPM option are identical to those for Commonwealth regulation, as set out in Table 7.2, except for the timing of implementation.

To give effect to national emission standards under a NEPM, a NEPM firstly needs to be developed through NEPC. Taking into account previous NEPM processes, the earliest practicable timeframe for this to occur is two years. The NEPM would specify emission standards and appropriate test procedures. Emission standards, however, would not take effect until NEPM provisions are incorporated into jurisdictional regulations.

All jurisdictions indicate that they currently have primary legislation in place under which regulations could be established. New regulations would take at least one year to implement, with a realistic timeframe being two years. Therefore, the earliest practicable timeframe for national emission standards to be implemented under a NEPM is in the order of four years. Under these assumptions, if NEPC in 2010 agrees to develop national emission standards under a NEPM, national standards could be implemented from 2014. This is two years later than the comparable policy scenario under Commonwealth regulation.

Table 7.8 below summarises the NPV data from Tables 7.4 and 7.6 to develop NPV estimates for the non-phased and phased combinations for the NEPM option. Note that NEPM scenarios assume a two-year delay and associated $479 million penalty in lost health benefits, as indicated in Table 7.6.

Table 7.8 Net present value to 2030 of costs for NEPM scenario combinations (2008 $million)

Non-Phased **OB-1a + PWC-1a + Grd-1a – delay cost**	**Phased** **OB-2a + PWC-2a + Grd-2a – delay cost**
2,202 + 99 + 692 – 479 = 2,514	2,167 + 97 + 686 – 479 = 2,471

Table 7.8 shows that implementing emission standards through the NEPM approach will result in a NPV of $2,514 million for the non-phased combination of scenarios and $2,471 million for the phased combination of scenarios.

7.6.3 Affected Parties

State/Territory Government Agencies

State and territory government agencies would need to adopt NEPM provisions in their own legislation and regulation to give effect to US emission standards. Currently, all jurisdictions have legislation in place which allows for the adoption of regulations that include product emission standards. The time needed to develop appropriate regulations that include NEPM provisions is in the order of two years. Based on feedback from state and territory governments, it is estimated that it would cost around $1 million per annum to monitor compliance and enforce regulations.

Garden and Marine Engine Industries

Under the NEPM option, industry may be faced with higher compliance costs than for the Commonwealth regulation option, as industry will need to deal with a number of government agencies, instead of a single regulatory agency.

Consumers

Impacts are identical to Commonwealth regulation option.

7.7 Use of Conservative Parameters in Impact Analysis

The NPV in Table 7.4 are conservative, in that they only assess the health impacts of avoided emissions of nitrogen oxides, VOC and particulate matter, and only the resulting reduction in direct health costs and lost income is considered. The estimates ignore non-monetary losses in welfare associated with illness and loss of life. Other avoided emissions, including water and noise pollution related damages are also not costed.

Estimates of the impacts of by applying US standards to the gardening equipment sector do not take into account the adoption of US Final Rule exhaust emission standards for garden equipment, as set out in Section 7.2. The US EPA estimated that a move to US Final Rule standards from US 2006 standards would provide net benefits of around US $1.3 billion per year by 2030. Adjusting for the lower Australian population, the move to US Final Rule standards for garden equipment and engines is likely to provide an additional NPV in the order of $90 million per year by 2030 in Australia. This applies to the Commonwealth regulation and NEPM options, but not the voluntary outboard industry agreement option.

Furthermore, for the marine sector, the impacts of regulating emission from sterndrive and inboard engines were not assessed. For the garden sector only the impacts of regulating emissions from lawn mowers, hedge trimmers, brush cutters and leaf blowers were assessed.

7.8 Comparative Assessment

This Section compares the costs and benefits of the three options considered to be feasible in delivering national emission standards:

1. A voluntary industry agreement, including sales target – outboard engines only
2. Commonwealth regulation – all specified garden and marine engines/equipment
3. National Environment Protection Measure (NEPM) – all specified garden and marine engines/equipment

Table 7.9 sets out the NPV for the three feasible delivery options of US Final Rule exhaust and evaporative emission standards for non-road spark ignition engines and equipment, including non-phased and phased options.

Table 7.9 Comparison of NPV to 2030 (2008 $million) for voluntary outboard industry agreement, Commonwealth regulation and NEPM options

NPV (2008 $million) Voluntary Outboard Industry Agreement with Sales Target for High-Emission Engines		NPV (2008 $million) Commonwealth Regulation		NPV (2008 $million) National Environment Protection Measure	
In 2020[1] (1a)	**In 2012[2] (1b)**	**Phased, or two-step[3] (2a)**	**Non-Phased, or one-step[4] (2b)**	**Phased, or two-step[3] (3a)**	**Non-Phased, or one-step[4] (3b)**
580	1,195	2,950	2,993	2,471	2,514

[1]**Outboard engines**: Sales target of 15% high-emission engines (zero- and 1- stars) met in 2020
[2]**Outboard engines**: Sales target of 15% high-emission engines (zero- and 1- stars) met in 2012
[3]**Outboard engines and personal watercraft**: US 2006 exhaust emission standards implemented from 2012, with US Final Rule exhaust and emission standards implemented from 2015
Garden equipment: US 2006 exhaust emission standards implemented from 2012, with US Final Rule evaporative emission standards implemented from 2015 – the impacts of US Final Rule exhaust standards were not assessed
[4]**Outboard engines and personal watercraft**: US Final Rule exhaust and evaporative emission standards implemented from 2012
Garden equipment: US 2006 exhaust emission standards and US Final Rule evaporative emission standards implemented from 2012 – the impacts of US Final Rule exhaust standards were not assessed

Table 7.9 shows that all feasible options to implement emission standards lead to a net benefit. However, the NPV associated with introducing national emission standards through a NEPM or Commonwealth regulation are significantly higher than for the voluntary outboard industry agreement option.

The voluntary outboard industry agreement option is the least effective of the three policy options assessed in this Section, even with an associated sales target, largely because it provides for less stringent standards by allowing engines to be sold that are not compliant with US standards. Furthermore, AMEC has indicated that it will not be enforceable, since importers could simply ignore any industry standards. AMEC has indicated that only around 20% of outboard engines are appropriately labelled since the inception of the voluntary emissions labelling scheme (VELS) in January 2007.

The NEPM option is formulated to achieve the same emission standards as the Commonwealth regulation option. However, in addition to the development of a NEPM, this option requires regulations to be implemented and enforced in each state and territory. Under this option, national regulatory consistency could be affected if compliance and enforcement regimes differ between states, even if all states enact identical legislation and regulations, and this could lead to varying environmental outcomes.

For the Commonwealth regulation and NEPM options, analysis shows that an earlier implementation date will result in higher NPV benefits, in the order of $250 million per year. This is because every non-compliant engine sold prior to regulation has more costs than benefits associated with it.

The additional benefits from the non-phased approaches, compared to the phased approaches, are modest and amount to $43 million in NPV. However, there is a risk that a phased approach may provide an incentive for manufacturers to “dump” engines in the period when Australian standards lag behind the US. Firms wanting to sell surplus stock that is compliant with the less stringent older US standards may find

Australia an attractive market. This has the potential to reduce the benefits of implementing a phased approach in Australia, and thus increase the relative benefits of non-phased options.

Of the three policy options assessed in Section 7, the Commonwealth regulation option is the preferred option, as it gives rise to $479 million additional NPV compared to the NEPM option. The additional NPV is based on the assumption that a NEPM approach will require an additional two years to implement national standards, when compared against the Commonwealth regulation approach. The Commonwealth regulation option also offers up to $1.6 billion dollars of additional benefits through restricting emissions from outboard engines when compared to the voluntary outboard industry agreement option.

8. CONSULTATION

Consultation to assist with the provision of information for the preparation of this consultation RIS has taken place with a number of stakeholders, including the following:

- Allpower Australia Pty Ltd
- Australian Outboard Engine Council
- Aussie Princess Boat Charter
- Briggs and Stratton Pty Ltd
- BRP Australia Pty Ltd
- Bunnings Pty Ltd
- Eco-Friendly Fishing Association
- Euromot
- GMC Pty Ltd
- Honda MPE Australia Pty Ltd
- Husqvarna Pty Ltd
- International Council of Outboard Industry Associations
- Mercury Outboard Pty Ltd
- MTD Pty Ltd
- Outboard Engine Distributors Association
- Outdoor Power Engine Association
- Shingu Pty Ltd
- Stihl Pty Ltd
- The Haines Group
- Tohatsu Lakeside Outboard
- Victa Pty Ltd
- Yamaha Motor Australia Pty Ltd

Consultation to date indicates that all organisations consulted are broadly in favour of introducing emission standards into Australia, in line with those established by the US EPA. Distributors of garden equipment and engines broadly favour establishing Australian emission standards as soon as practicable. However there is a division of opinion in the marine engine industry about the optimum timing for the introduction of emission standards for marine engines and equipment, with AMEC strongly in favour of introducing US emission standards into Australia as soon as practicable.

OEDA, while conceding that emission regulations are necessary to reduce the impacts of emissions from marine engines, favour a delay, until 2015, in introducing US Final Rule emission standards into Australia, in order to allow the marine industry sufficient time to adjust their product lines so they comply with a new regulatory regime. OEDA has also indicated that they see VELS as a viable scheme to reduce emissions from outboard engines.

AMEC does not support VELS, and they state that the technology to meet US Final Rule emission standards is well-established, and there is already a wide range of products available that comply with these emission standards.

9. CONCLUSION AND PREFERRED OPTION

The analysis of the three feasible options assessed in this consultation RIS demonstrates that there would be a net community benefit in introducing emission standards for non-road spark ignition engines and equipment in Australia.
This conclusion holds, despite the fact that the analysis undertaken is very conservative in that:

- Only the health impacts of avoided emissions of nitrogen oxides, VOC and particulate matter are considered. Benefits from all other avoided emissions are ignored.
- Only direct health costs and lost income are considered. These ignore non-monetary losses in welfare associated with illness and loss of life.
- Water and noise pollution benefits are ignored.
- At every point where an assumption was made in the modelling, the assumption leading to the least emission reduction was chosen.
- For garden equipment engines, only a sub-sector of gardening equipment was assessed for impacts and only the benefits of adopting the less stringent US 2006 exhaust emission standards were taken into account.

Of the three main policy options assessed, the voluntary outboard industry agreement is the least effective, largely because it provides for less stringent standards by allowing outboard engines to be sold that are not compliant with US standards. Indeed, even if the assessment had shown larger net benefits for the voluntary industry agreement option, strong doubts about the merit of its implementation would remain. A number of outboard industry representatives do not consider it to be a viable option, and such an agreement will only be effective with strong support from industry.

The Commonwealth regulation option stands out as the most beneficial option, as it will lead to around $2.95 billion in benefits to 2030, which is around $479 million more than the NEPM option. This is based on an implementation delay of two years, when compared against the Commonwealth regulation option. The Commonwealth regulation option also offers up to $1.6 billion dollars of additional benefits through restricting emissions from the outboard sector when compared to the voluntary outboard industry agreement option.

The greatest benefits in terms of NPV would be achieved through a “non-phased”, or one-step approach, where US standards currently in force at the time legislation is enacted in Australia are adopted in Australian regulations without a lag behind the US.

For the Commonwealth regulation and NEPM options, bringing forward the date for implementation of emissions regulations will result in a higher NPV, in the order of $250 million per year.

Overall, the preferred approach is the adoption of US emission standards in force at the time regulations are implemented in Australia (i.e. a non-phased approach), through Commonwealth regulation, with regulations to take effect as soon as practicable.

10. IMPLEMENTATION AND REVIEW

The preferred option, ie US Final Rule standards to be implemented through Commonwealth regulation, would involve the development of Commonwealth legislation, which will enable the establishment of national emission standards for non-road spark ignition engines and equipment.

Under the new legislation, statutory independent review will be required two years after the first set of standards comes into effect and every five years thereafter. At this stage, taking into account expected statutory timelines, it is expected that new legislation and associated regulations could be implemented in 2012.

Enforcement of new regulations would occur through inspection of designated engines and ensuring that labelling for these engines complies with regulated emission standards. Enforcement would take place at the point of manufacture or importation. It is envisaged that compliance with standards will not result in significantly higher record keeping costs for the large majority of distributors that already distribute relevant engines in the US and Europe.

The effectiveness of the measures would be measured in a number of ways:

- The availability of low emission non-road spark ignition engines and equipment in the Australian market
- Measured reductions in emissions compared to business as usual scenarios
- Improved labelling of non-road spark ignition engines and equipment
- Greater community awareness of the importance of low emission engines and equipment
- Greater uptake of low emission technologies

11. NEXT STEPS

This consultation RIS assesses a range of options to reduce the adverse impacts of non-road spark ignition engines and equipment on human health.

Stakeholder comments are invited on the assessment and any feedback will be used to inform a decision RIS, which will recommend to the National Environment Protection Council (NEPC) a preferred option to address emissions from non-road spark ignition engines and equipment. NEPC will then make a decision on the way forward.

This consultation RIS is available on the EPHC website www.ephc.gov.au for comment from **25 May 2010** for a period of eight weeks. No formal response will be provided on submissions to the discussion paper. All submissions will be considered public documents unless clearly marked "confidential" and may be made available to other interested parties, subject to Freedom of Information Act provisions. Electronic submissions are preferable and should be received by the NEPC Service Corporation by close of business **20 July 2010**. Submissions may also be provided as hard copies, CD or fax. Submission details are as follows:

email to:
kscott@ephc.gov.au

CD ROM or hardcopy to:
Project Manager
NEPC Service Corporation
Level 5/81 Flinders Street
ADELAIDE SA 5000

Fax to:
(08) 8224 0912

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Appendix 1
Summary of US Final Rule Emission Standards and Proposed Implementation Timetable for Australia

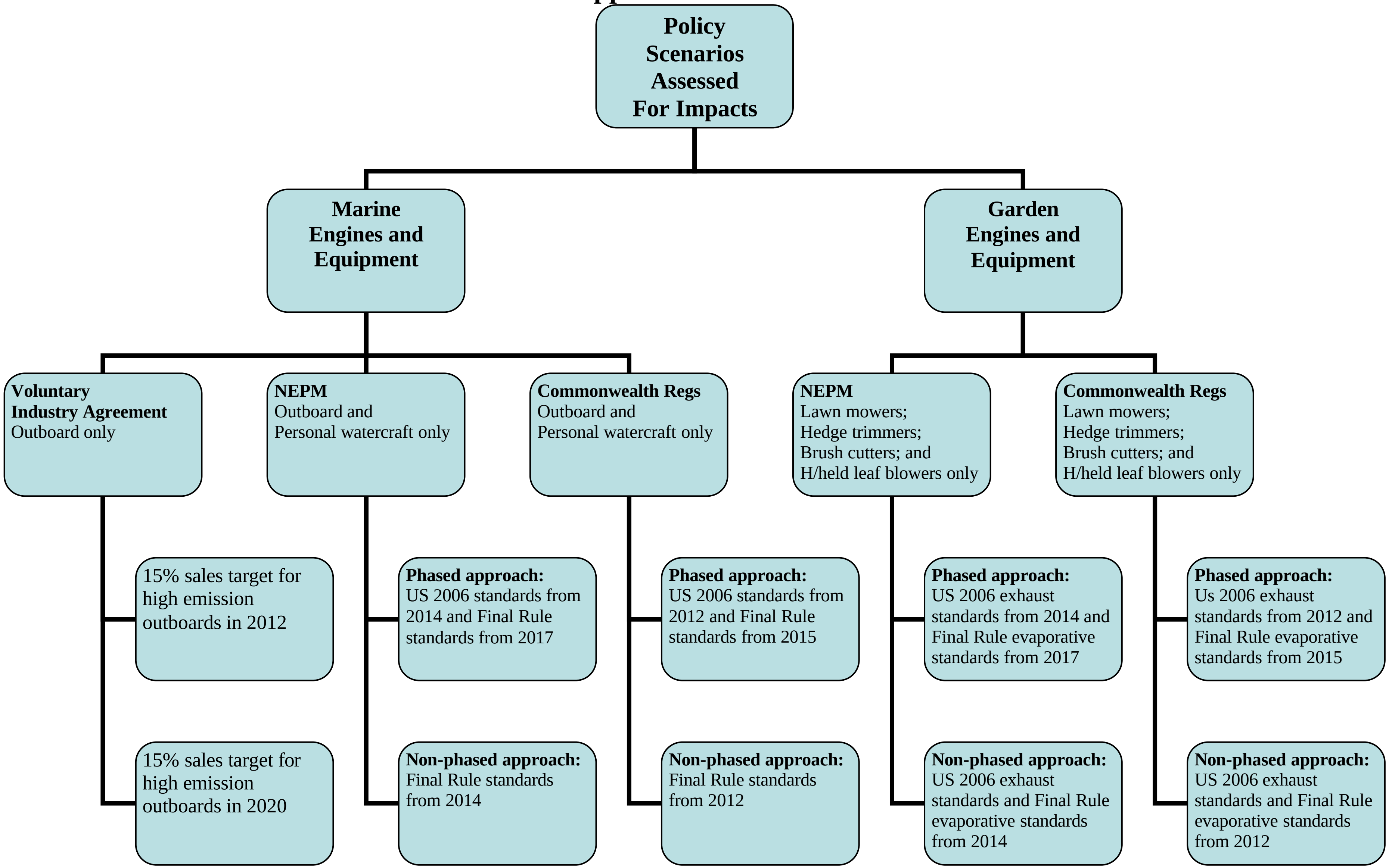
Garden Equipment – Exhaust Emission Standards		
Engine Class	**US Final Rule implementation**	**Australian implementation***
Class I **Non-handheld** **<225 cc** Walk behind lawn mowers Small electrical generators Pressure washers	More stringent standards for HC+NOx to take effect in 2012, with US EPA 2006 standards to apply until 2012 No change to US EPA 2006 emission standards for CO	US EPA 2012 standards for HC+NOx to take effect in 2012 US EPA 2006 standards for CO to take effect in 2012
Class II **Non-handheld** **≥225 cc** Ride-on mowers Zero-turn mowers Larger electrical generators	More stringent standards for HC+NOx to take effect in 2011, with US EPA 2006 standards to apply until 2011 US EPA 2006 standards for CO to take effect in 2012	US EPA 2011 standards for HC+NOx to take effect in 2012 US EPA 2006 standards for CO to take effect in 2012
Classes III, IV and V **Handheld** **<20 cc (Class III)** **>20 cc to 50 cc (Class IV)** **50 cc (Class IV)** Line trimmers Edgers Leaf blowers Chainsaws	No change to US EPA 2006 emission standards	US EPA 2006 standards for HC+NOx and CO to take effect in 2012
Garden Equipment – Evaporative Emission Standards for Hydrocarbons (HC)		
Engine Class	**US Final Rule implementation**	**Australian implementation***
Class I **Non-handheld** **<225 cc** Walk behind lawn mowers Small electrical generators Pressure washers	Hose permeation standards for HC introduced in 2009 Tank permeation standards for HC introduced in 2012 Running loss standards for HC introduced in 2012	US EPA 2009 standards for HC to take effect in 2012 US EPA 2009 standards for HC to take effect in 2012 US EPA 2009 standards for HC to take effect in 2012
Class II **Non-handheld** **≥225 cc** Ride-on mowers Zero-turn mowers Larger electrical generators	Hose permeation standards for HC introduced in 2009 Tank permeation standards for HC introduced in 2011 Running loss standards for HC introduced in 2011	US EPA 2009 standards for HC to take effect in 2012 US EPA 2011 standards for HC to take effect in 2012 US EPA 2011 standards for HC to take effect in 2012
Classes III, IV and V **Handheld** **<20 cc (Class III)** **>20 cc to 50 cc (Class IV)** **50 cc (Class IV)** Line trimmers Edgers Leaf blowers Chainsaws	Hose permeation standards for HC introduced in 2012-2016, depending on equipment Hose permeation standards for HC introduced in 2009-2013, depending on equipment No running loss standards	US EPA 2012 - 2016 standards for HC to take effect in 2012-2016 US EPA 2009 - 2013 standards for HC to take effect in 2012-2013 No running loss standards

*Based on implementing new regulations in 2012

Marine Equipment – Exhaust Emission Standards		
Engine Class	**US Final Rule implementation**	**Australian implementation***
Outboard engines Personal watercraft Sterndrive engines Inboard engines	More stringent standards for HC+NOx and CO to take effect in 2010	US EPA 2010 standards for HC+NOx and CO to take effect in 2012
High performance sterndrive and inboard engines above 373 kW power output	Gradually more stringent standards for HC+NOx introduced over 2010-2011, depending on engine power output Standards for CO introduced in 2010	US EPA 2011 standards for HC+NOx to take effect in 2012 US EPA 2010 standards for CO to take effect in 2012
Marine Equipment – Evaporative Emission Standards for Hydrocarbons (HC)		
Equipment	**US Final Rule implementation**	**Australian implementation***
Personal watercraft Portable tanks	Hose permeation standards for HC introduced in 2009 Tank permeation standards for HC introduced in 2011 Diurnal loss standards for HC introduced in 2010	US EPA 2009 standards for HC to take effect in 2012 US EPA 2011 standards for HC to take effect in 2012 US EPA 2010 standards for HC to take effect in 2012
Other installed tanks	Hose permeation standards for HC introduced in 2009-2015, depending on tank type Tank permeation standards for HC introduced in 2012 Diurnal loss standards for HC introduced in 2011-2013, depending on tank type	US EPA 2009-2015 standards for HC to take effect in 2012-2015 US EPA 2012 standards for HC to take effect in 2012 US EPA 2011-2013 standards for HC to take effect in 2012-2013

*Based on implementing new regulations in 2012

Appendix 2



Policy Scenarios Assessed For Impacts
Marine Engines and Equipment
Garden Engines and Equipment
Voluntary Industry Agreement Outboard only
NEPM Outboard and Personal watercraft only
Commonwealth Regs Outboard and Personal watercraft only
NEPM Lawn mowers; Hedge trimmers; Brush cutters; and H/held leaf blowers only
Commonwealth Regs Lawn mowers; Hedge trimmers; Brush cutters; and H/held leaf blowers only
15% sales target for high emission outboards in 2012
15% sales target for high emission outboards in 2020
Phased approach: US 2006 standards from 2014 and Final Rule standards from 2017
Non-phased approach: Final Rule standards from 2014
Phased approach: US 2006 standards from 2012 and Final Rule standards from 2015
Non-phased approach: Final Rule standards from 2012
Phased approach: US 2006 exhaust standards from 2014 and Final Rule evaporative standards from 2017
Non-phased approach: US 2006 exhaust standards and Final Rule evaporative standards from 2014
Phased approach: Us 2006 exhaust standards from 2012 and Final Rule evaporative standards from 2015
Non-phased approach: US 2006 exhaust standards and Final Rule evaporative standards from 2012