

# Diesel and Marine Emissions Management Strategy



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## Strategy at a glance

<p><b>Objective:</b> Progressively control and reduce diesel and marine emissions from priority sectors – shipping, locomotives and non-road equipment used by EPA-licensed industry and in government activities.</p>		
Focus areas	Goals	Milestones
Priority industries and NSW government equipment	<ul style="list-style-type: none"> <li>Introduce requirements on open cut coal mines for best practice to reduce diesel exhaust emissions from non-road plant and equipment</li> <li>Require staged improvement of non-road diesel engines operating at EPA-licensed premises or undertaking EPA-licensed activities</li> <li>Collaborate across government and with private organisations to investigate and promote best practice diesel emissions management and exposure reduction</li> <li>Implementation of <i>NSW Government Resource Efficiency Policy</i> (OEH 2014) for Government-owned non-road diesel equipment and equipment used under contract to NSW agencies</li> </ul>	<ul style="list-style-type: none"> <li>Proposed requirements for coal mines to conduct a best management practice determination to identify options for diesel exhaust reduction: 2nd quarter 2015</li> <li>Proposed investigation of minimum performance standards for all non-road diesel equipment used for identified scheduled activities: 4th quarter 2015</li> <li>Major infrastructure projects non-road diesel emissions reduction workshops for government agencies and industry stakeholders: 1st quarter 2015</li> <li>Minimum performance standards apply to new mobile non-road diesel plant and equipment procured by government agencies from January 2015. Government tender processes to include weighting for lower emission machines for leased non-road machinery and contractor's machines: December 2015</li> </ul>
Rail – locomotives and rail construction	<ul style="list-style-type: none"> <li>Investigate feasibility and support adoption of new emissions control technology for locomotives</li> <li>Update NSW regulatory framework to ensure accountability of diesel locomotive operators for improved emissions performance</li> </ul>	<ul style="list-style-type: none"> <li>Proposed changes to Schedule 1 of POEO Act – Legislative amendment: 2nd quarter 2015</li> <li>Pilot locomotive emission upgrade program completed: 3rd quarter 2015</li> <li>Licensing of rolling stock operators and of rail construction activities as separate scheduled activities expected to commence: 4th quarter 2015</li> </ul>
Shipping – cruise shipping and containerised and bulk cargo operations in NSW	<ul style="list-style-type: none"> <li>Improve the evidence base on shipping emissions and management options for NSW</li> <li>Identify feasible and timely emission reduction options</li> <li>Reduce shipping emission impacts on urban areas close to ports in NSW</li> <li>Update the regulatory framework to support managing shipping emissions in NSW</li> </ul>	<ul style="list-style-type: none"> <li>Complete feasibility of emissions reduction from shipping research project and hold public seminar: 2nd quarter 2015</li> <li>Finalise timetable for identified actions, including any changes required to the regulatory framework: 3rd quarter 2015</li> </ul>
Evidence base on non-road diesel and marine emissions	<ul style="list-style-type: none"> <li>Improve the evidence base on diesel and marine emissions in NSW, options for managing emissions and health and economic drivers for emission reductions</li> </ul>	<ul style="list-style-type: none"> <li>Completion of research project into health impacts of different sources, types and levels of particle pollution and public seminar: 2nd quarter 2015</li> <li>Update of GMR Air Emissions Inventory with 2013 emissions data: 2016</li> </ul>

## Introduction

Non-road diesel exhaust and shipping emissions contain high levels of pollutants that can harm human health. Fine particulate pollution (PM<sub>2.5</sub>), in particular, is a priority for the NSW Environment Protection Authority (EPA) due to its adverse health impacts. Those most affected are the elderly, children and those with existing health conditions. Numerous studies have linked fine particle exposure to a variety of cardio-vascular and respiratory diseases and, in 2012, the World Health Organisation's International Agency for Research on Cancer classified diesel exhaust as a human carcinogen. Sulfur oxides (SO<sub>x</sub>) and oxides of nitrogen (NO<sub>x</sub>) also have adverse health impacts and contribute to fine particulate pollution.

The EPA leads Australia in seeking controls on non-road diesel and marine emissions and has developed this strategy in response to:

- mounting evidence of the adverse health impacts of diesel and marine emissions and growing community concern
- the growth of non-road diesel and shipping emissions and their growth relative to on-road vehicle emissions, which have been reduced through strict national engine and fuel standards
- the availability of feasible and cost-effective technologies and effective regulatory approaches to control these emissions, as demonstrated by the United States, European Union and many other countries.

The strategy follows the principles and process set out in [Managing Particles and Improving Air Quality in NSW](#) (EPA 2013). These guiding principles, which are used to address all significant sources of particle pollution in NSW, include:

- Achieve national air quality goals and protect air quality for all communities
- Strengthen and act on evidence
- Use innovative and effective tools
- Develop least cost pathways to improve air quality and maximise net benefits
- Engage and inform the community
- Collaborate on cleaner air at all levels of government – local, state and national.

The strategy presents actions to improve the evidence base, trial technologies and progressively control and reduce emissions from priority sectors. These sectors include:

- cruise shipping and containerised and bulk cargo operations in NSW
- locomotives operating on the NSW rail network
- non-road diesel equipment operated by priority industry sectors and equipment owned by government or operated under government contracts.

While directed to wide and long-term benefits for NSW air quality, the strategy prioritises for action those locations where population exposure and emission impacts are greatest.

### **Air and health impacts of non-road diesel and marine emissions**

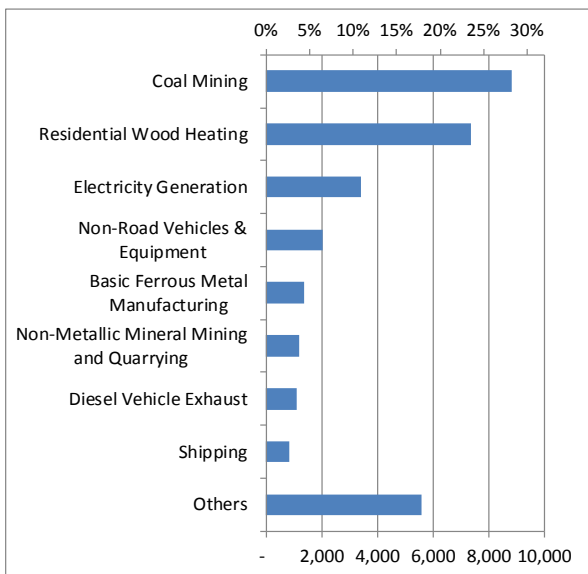
The non-road emissions sector covers diesel-powered construction and mining equipment, rail locomotives, ports equipment and ships. According to the 2008 [NSW Air Emissions Inventory](#), (EPA 2012) non-road plant and equipment is the fourth largest human-made source of fine particle emissions in Sydney's Greater Metropolitan Region (GMR) (Figure 1).

The air emissions inventory shows that on-road diesel vehicles and non-road engines together produce 14% of all PM<sub>2.5</sub> emissions from human activities in the GMR. Although non-road engines consume less fuel in total than on-road vehicles, they produce more than double the PM<sub>2.5</sub> emissions (10% compared to 4%).

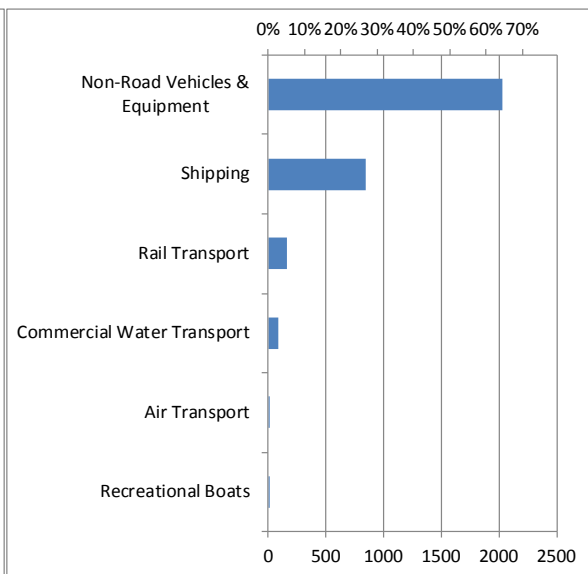
Inventory data also shows that non-road diesel equipment at industrial premises accounts for 64% of all non-road diesel emissions in the GMR (Figure 2). Across all industrial premises in the GMR, diesel equipment at coal mines accounts for 86% of the total PM<sub>2.5</sub> emissions.

Other industrial activities with significant non-road diesel emissions are: metalliferous mines, quarries, landfill or waste operations, ports, and construction and infrastructure projects.

**Figure 1: PM<sub>2.5</sub> emissions in the GMR for human-made sources (tonnes/year, 2008)**



**Figure 2: PM<sub>2.5</sub> Emissions in the GMR for non-road diesel sources (tonnes/year, 2008)**



Source: [EPA 2012](#)

**Note:** In Figure 1, the 'coal mining' activity includes only fugitive PM<sub>2.5</sub> emissions. Exhaust emissions from non-road diesel equipment used in coal mining are included in the 'non-road vehicles & equipment' category.

NSW-led work on national particle standards and potential control measures, as part of the review of particle standards in the *National Environment Protection (Ambient Air Quality) Measure*, (Commonwealth of Australia 1998) has highlighted substantial health and economic benefits available from reducing particle emissions in Australia. A major body of evidence from Australian and overseas studies demonstrating the health impacts of particles and benefits of avoiding particle emissions, including evidence specific to Sydney and NSW, is published in the [Draft Variation to the National Environment Protection \(Ambient Air Quality\) Measure Impact Statement](#) (Commonwealth of Australia 2014).

### Stakeholder engagement

The EPA is committed to stakeholder participation in developing and implementing each element of this strategy. The EPA consults with stakeholders – to communicate the evidence base, learn from the community's and stakeholders' knowledge, expertise and ideas, and ensure that future actions, including potential regulatory measures, are effective, well understood and realistic to deliver.

The EPA held an initial workshop in June 2014, with participation from the Minister for the Environment, the EPA Chair and CEO and approximately 115 representatives from construction, mining, ports, rail, community and government sectors. A background paper on diesel emissions, [Diesel emissions and their management in NSW](#) (EPA 2014a), was

circulated beforehand and a survey seeking stakeholder comments and insights on the management of emissions and potential controls was distributed to attendees. Presentations and survey results from the workshop are available at the [Managing non-road diesel and marine emissions](#) webpage on the EPA website. In November 2014, the EPA held a further workshop with shipping industry stakeholders on management of shipping emissions (discussed under Shipping and Ports).

The EPA will continue to engage stakeholders on proposals developed under this strategy, in particular, new regulatory measures, which will be subject to analysis of the feasibility and costs and benefits associated with different options and timeframes. Opportunities for future stakeholder engagement are discussed in the following pages on a sector by sector basis.

## Focal sectors for reducing emissions

### Non-road equipment used by EPA-licensed industry and in government activities

#### Goals

- Collaborate across the government and private sectors to identify and promote best practice diesel emissions management and exposure reduction.
- Support the Government Resource Efficiency Policy to reduce diesel emissions from non-road diesel equipment procured by or operated under contracts for NSW government agencies.
- Using an evidence-based approach, require improved diesel equipment and emissions management at coal mines through pollution reduction programs attached to licences.
- Update the regulatory framework to support improving standards of non-road diesel equipment used by priority EPA-regulated activities.

#### Drivers for action

Non-road diesel vehicles and equipment such as cranes, gantries, bulldozers, loaders and trucks, used in construction and industrial activities and at ports and coal mines, make a significant contribution to man-made particulate and ozone precursor emissions in the GMR. The non-road diesel sector is the fourth largest man-made source of PM<sub>2.5</sub> emissions in the GMR and the largest unregulated source.

At present there are no regulations applying to emissions from non-road diesel vehicles or equipment in Australia except in underground coal mines. Regulated emission limits for non-road diesel sources have been in force in the US and EU since the mid-to-late 1990s and were more recently introduced in Canada, Russia, Switzerland, Turkey, Japan, China, India, South Korea, Singapore and Brazil (ECOpoint 1997–2014). Emission limits are generally phased in over a number of years, some applicable by vehicle class or size, and some having transitional provisions. For example, in the US, equipment greater than 560kW will need to meet Tier 4 standards by 2018, with some transitional provisions available to manufacturers out to 2021.

The EPA has undertaken a substantial analysis of potential actions to reduce non-road diesel engine emissions in Australia. The study report, [Reducing Emissions from Non-road Diesel Engines](#) (EPA 2014b) was released in August 2014. The study investigated three scenarios for introducing emission standards for new non-road engines in Australia to harmonise with US and EU non-road diesel engine emission standards. It found that the net health benefits, calculated over a period from 2015 to 2055, could be in the range of approximately \$1.25 to \$2.24 billion with the greatest benefits available from a staged introduction and tightening of engine emission standards (EPA 2014b).



The EPA is pursuing the introduction of national standards but recognises the need for more immediate action to reduce non-road diesel emissions and bring forward community health benefits.

## **EPA actions**

### ***Clean machines***

From 2011–2014, the EPA ran the Clean Machine Program, to raise stakeholder awareness on health impacts of diesel exhaust emissions and encourage voluntary emission reductions from non-road diesel plant and equipment. It supported diesel emission reductions by promoting procurement of lower emitting equipment and better worksite practices and by subsidising retrofitting of heavily polluting machines with exhaust emissions after-treatment devices.

The program targeted some of the most significant sources of non-road diesel emissions in GMR, including the construction and infrastructure sector, ports, quarries and waste facilities. As at December 2014, more than 36 organisations throughout the GMR, including private businesses and local councils had participated in the program and 138 diesel machines had been retrofitted with NSW government subsidies of \$811,000. It is estimated that these retrofits will reduce 36 tonnes of diesel particle emissions over 10 years, yielding substantial public health benefits worth around \$8 million. Further information is available on the EPA website at [Cleaner non-road diesel plant and equipment](#).

Information and understanding gained from the Clean Machine Program and the practical experiences with diesel retrofitting and inter-agency collaboration have fed into the development of further EPA initiatives, such as the locomotive upgrade project and the 'clearing the air – mobile plant emissions' project discussed below.

The Clean Machine Program also provides the platform for a further EPA project to encourage and raise awareness of the benefits of improved diesel emissions management, gather and share information and case studies relating to best practice and facilitate collaboration among stakeholders to minimise diesel emissions. For example, the EPA has advised and is supporting NSW WorkCover on a project to reduce exposure to diesel exhaust emissions. While focused on workers, this will also benefit local communities. For more information contact WorkCover on 13 50 10 or visit [workcover.nsw.gov.au](http://workcover.nsw.gov.au).

### ***Clearing the air – Mobile plant emissions***

The EPA has commenced a project that focuses on diesel equipment used in major infrastructure construction projects in the Sydney region, where there is potentially high population exposure to diesel emissions.

The EPA has held discussions with the construction industry and government agencies responsible for significant public infrastructure and will conduct workshops for government agencies and industry stakeholders by early 2015. The project will encourage the use of planning consent conditions and commercial contract clauses to require lower emissions from plant and equipment used on major construction sites.

It is proposed that requirements to use lower-emission equipment be supported by EPA environment protection licence conditions where applicable. Development of specific regulatory elements such as licence conditions will be coordinated with the development of any broader regulatory amendments under the Clean Air Regulation, discussed below.

### ***Government resource efficiency policy***

In July 2014, the NSW Government released its [Resource Efficiency Policy](#) (OEH 2014). The policy, administered by the Office of Environment and Heritage (OEH), includes requirements to address non-road diesel engine emissions through government procurement and contracts.



From 1 January 2015, mobile non-road diesel plant and equipment purchased by NSW Government agencies must meet minimum performance standards that are:

- US EPA Tier 3 or EU Stage IIIA compliant for engines 19 to 560 kW
- US EPA Tier 2 or EU Stage II compliant for engines greater than 560 kW.

From 1 January 2018, the standards will tighten, and the minimum performance standard for newly purchased mobile non-road diesel plant and equipment must be US EPA Tier 4 or EU Stage IV compliant.

In addition, from December 2015 NSW Government tender processes are required to include a weighting for lower-emission machines. This aims to encourage use of cleaner leased machinery and contractor's machines, where they are fit for purpose.

The NSW Office of Finance and Services will update the State Government contract requirements for the leasing and purchase of equipment to reflect the policy requirements. Agencies must also publish an annual statement outlining how they have complied with the policy, and any instances of non-compliance are to be noted and explained. The EPA will continue to provide information and advice to assist in implementing the policy.

### *Reducing non-road diesel emissions from coal mines*

Coal mining is the most significant non-road diesel emission source, accounting for 86% of all industrial non-road diesel equipment PM<sub>2.5</sub> emissions in the GMR. In the Hunter region, industrial non-road diesel equipment at coal mines account for 95% of the total PM<sub>2.5</sub> non-road diesel emissions.

The EPA has undertaken a major project, which aims to introduce best practice measures to reduce non-road diesel emissions at coal mines. The methodology and findings have been documented in a draft report, which was released for public comment in December 2014. It includes:

- a review of international best practice measures to reduce non-road diesel emissions at NSW coal mines,
- a survey of all EPA-licensed coal mines to determine the size, composition, emissions certification, activity levels, fuel types and consumption and maintenance practices of the non-road diesel fleet,
- a comparison of international best practice measures to reduce non-road diesel emissions with those currently used at each NSW coal mine,
- an identification of international best practice measures that could practicably be implemented at each NSW coal mine, and
- a cost-benefit analysis of implementing the identified emission reduction measures at NSW coal mines.

The draft report presents the scientific, technical, health and economic evidence for determining the extent to which non-road diesel exhaust particulate emissions at NSW coal mines can practicably be reduced. The draft report is available on the EPA website at: [Proposed actions for non-road diesels used at NSW coal mines](#) (EPA 2014c).

Subject to consideration of the recommendations in the draft report, the EPA proposes to use environment protection licence conditions to require each coal mine to evaluate its current non-road diesel emissions management strategy against industry best practice and identify reasonable and feasible improvements. This follows the same model used for the 'Dust Stop' program, which the EPA has implemented to reduce fugitive dust emissions from coal mines.

## Future actions

### *Non-road machines – licensed activities*

The air emissions inventory shows that non-road diesel equipment operated at EPA-licensed premises in the GMR consumes two-thirds of the diesel used by the entire on-road diesel vehicle fleet but produces over 80% more PM<sub>2.5</sub> and over 20% more NO<sub>x</sub>. Of all non-road diesel equipment and vehicles (excluding ships using residual oil fuel), non-road diesel equipment at licensed industrial facilities produces 87% of the PM<sub>2.5</sub> and 74% of the NO<sub>x</sub>.

Based on this data the EPA is commencing a project to identify activities with the highest non-road diesel emissions that are also scheduled under the *Protection of the Environment Operations Act 1997* (POEO Act). As well as coal mining, scheduled activities include:

- metallurgical activities (iron, steel and alumina production)
- extractive activities (land, water and other)
- mining for minerals
- waste disposal to land
- shipping in bulk
- railway systems activities
- road construction.

Subject to the outcomes of the coal mine project above, the EPA will consider extending action on non-road diesel emissions to these other industry sectors. A survey of these sectors will be undertaken in conjunction with the survey of industry to update the air emissions inventory (discussed under Update air emissions inventory findings). The EPA will use the findings to consider potential regulatory measures to require minimum performance standards aligned with international standards for non-road diesel equipment used in scheduled activities. This course of action would be assessed against options of taking no action and voluntary action by industry.

### Milestones

Action	Date
Minimum performance standards apply to new mobile non-road diesel plant and equipment procured by government agencies	January 2015
Major infrastructure projects non-road diesel emissions reduction workshops for government agencies and industry stakeholders	1 <sup>st</sup> quarter 2015
Proposed requirements for coal mines to conduct a best management practice determination to identify options for diesel exhaust reduction	2 <sup>nd</sup> quarter 2015
Proposed investigation of minimum performance standards for all non-road diesel equipment used for identified scheduled activities	4 <sup>th</sup> quarter 2015
Government tender processes to include weighting for lower emission machines for leased non-road machinery and contractor's machines.	December 2015

## Rail sector – Locomotives and rail construction activities

### Goals

- Investigate feasibility and support adoption of new emissions control technology for locomotives
- Update NSW regulatory framework to ensure accountability of diesel locomotive operators for improved emissions performance

### Drivers for action

Australia currently has no national standards for exhaust emission limits for new or re-manufactured locomotives. Standards for new locomotives are needed for long-term fleet emission reductions but, given low fleet turnover, it is also important to address emissions from in-service locomotives.

Since 2000, the United States has implemented a tier system of locomotive emission standards applying to both new locomotives and existing locomotives when they are 'remanufactured' (engine rebuild/overhaul). Californian initiatives include agreements with fleet operators for fleet operating in the South Coast Air Quality Management District for fleet to meet Tier 2 standards on average, low sulfur diesel fuel requirements for intra-state locomotives and subsidies for engine replacement and repowering. The European Union has phased in progressively stricter standards for locomotives since 2004. The EPA has undertaken a [Scoping Study of Potential Measures to Reduce Emissions from New and In-Service Locomotives in NSW and Australia](#) (Environ, 2013). It found that around 80% of existing Australian locomotives do not meet any US emissions standard.

The EPA has also consulted on a proposal to update its own regulatory framework for rail. Currently the EPA licenses track managers and has relied on them passing on environmental obligations to operators of rolling stock, including locomotives. The effectiveness of this approach has been eroded as the rail operating environment becomes more complex, with an increasing number of regulatory authorities and track managers involved, all with varying business models, policies and priorities.

With growth in rail freight, there is potential for significant growth in diesel locomotive emissions. Though they are currently a relatively minor contributor to regional PM<sub>2.5</sub> loads, locomotive emissions can impact on local communities. Professor Louise Ryan, distinguished Professor of Statistics at the University of Technology Sydney, in undertaking a [Re-analysis of findings from dust studies in the Hunter rail corridor](#) for the EPA (Ryan & Wand 2014), identified that diesel emissions from locomotives may be a significant contributor to the PM<sub>2.5</sub> levels impacting on the local community.

### EPA actions

#### *Pilot program – Locomotive engine emission upgrade*

The industry practice of re-building locomotives during their long lifetime affords the opportunity to reduce emissions by retrofitting of emissions upgrade kits at the engine's scheduled re-build. These kits have been developed to meet the mandatory emission standards applied to existing locomotives in the US. 'US Tier zero plus' (Tier 0+) emission kits have been shown in the US to achieve a reduction in emissions and two to five percent improvement in fuel economy and are now becoming available in Australia.

The EPA has initiated a pilot project with rail industry partners, to validate the emission reductions and fuel efficiencies that can be achieved using Tier 0+ emission kits. The project will retrofit two diesel locomotives operating in NSW and scheduled for rebuild in 2015. The locomotives will be tested for emissions and fuel consumption after engine rebuild to the original (unregulated) standard and repeated after rebuild with a Tier 0+ emission upgrade

kit. Noise testing will also be conducted for both engine configurations to ensure no adverse noise effects.

Results of this demonstration project will inform future actions to support wider take-up of the emission upgrade technology across the locomotive fleet operating in NSW.

### *Review of regulatory framework for the NSW operational rail sector*

The EPA has reviewed the regulatory framework for the expanding NSW operational rail sector to identify ways to support more effective management of environmental and community impacts. The principal challenge is to ensure that entities with direct responsibility for managing environmental issues, namely air and noise impacts, are held accountable. The review concluded that regulation should include licensing rolling stock operators, as well as railway system operators, under the POEO Act. This will enable the EPA to set environmental requirements for locomotives and hold operators responsible for environmental performance.

The EPA also reviewed the current approach to regulating rail construction activities and concluded these should also be a separate scheduled activity under the POEO Act. A further recommendation was that changes should be made so that the type of construction work captured under the POEO schedule is determined by the degree of impact of the construction activity rather than the nature of the rail being constructed.

### *Stakeholder engagement*

The EPA prepared a position paper, [Review of regulation of 'railway systems activities' under the Protection of the Environment Operations Act 1997](#) (EPA 2014d), that details the rail regulation review process, proposed changes to the rail regulatory framework and likely impacts of those changes. The paper and proposed changes were presented and discussed at a forum with the rail industry in September 2014, and the paper was placed on public exhibition with submissions sought from stakeholders until October 2014.

### *Future actions*

The proposal for changes to the rail regulatory framework is being refined in response to issues raised during consultation. It is anticipated that the framework will be amended in 2015, with a transition period prior to requiring rolling stock operators to hold environment protection licences. The development of conditions or pollution reduction programs for these licences will be informed by other current EPA research and projects, including the locomotive engine emission upgrade pilot project. Other potential emission reduction options, such as requiring new locomotives to meet US emission standards, will continue to be scoped and assessed.

### *Milestones*

<b>Action</b>	<b>Date</b>
Proposed changes to Schedule 1 of POEO Act – Legislative amendment	2 <sup>nd</sup> quarter 2015
Pilot locomotive emission upgrade program completed	3 <sup>rd</sup> quarter 2015
Licensing of rolling stock operators and of rail construction activities as separate scheduled activities for EPA licensing expected to commence	4 <sup>th</sup> quarter 2015

## Shipping and ports

### Goals

- Improve the evidence base on shipping emissions and management options for NSW
- Identify feasible and timely emission reduction options
- Reduce shipping emission impacts on urban areas close to ports in NSW
- Update the regulatory framework to support managing shipping emissions in NSW, where appropriate

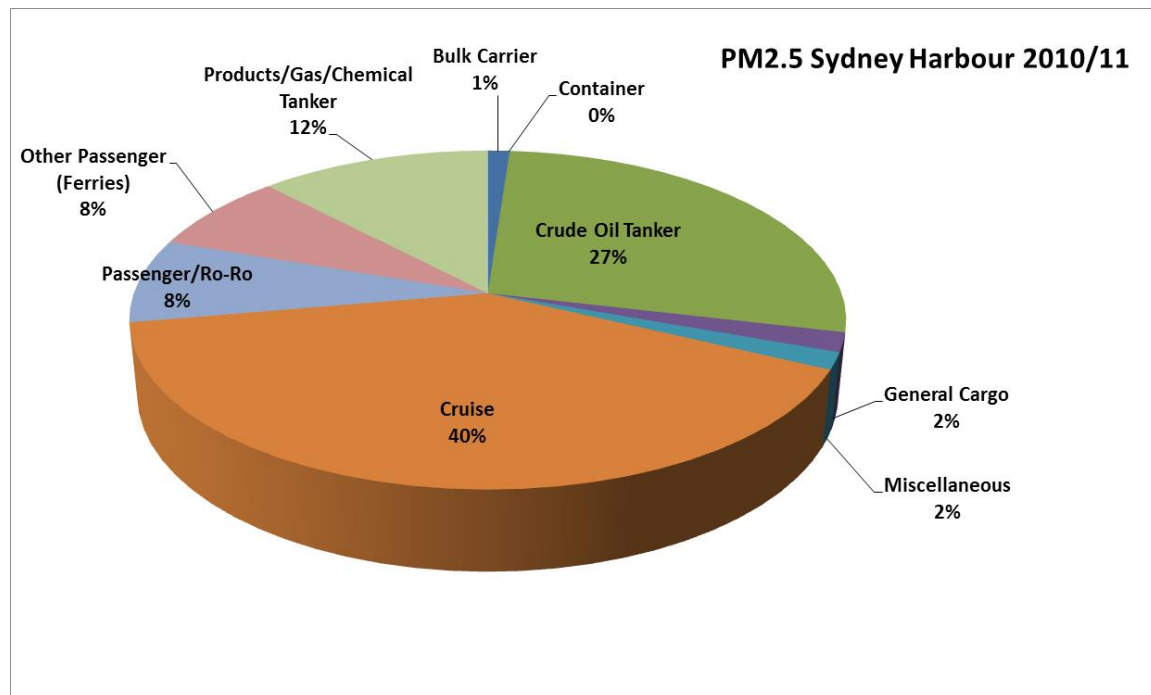
### Drivers for action

The impact of air emissions from shipping in coastal regions and ports and exposure to these in nearby urban regions is increasing with growth in shipping activity. Shipping emissions from Port Jackson, Port Botany, Newcastle Port and Port Kembla impact on population centres in Sydney, Newcastle and Wollongong. There is also community concern regarding local impacts from cruise ships berthed at the White Bay passenger terminal in Sydney Harbour, since it began operating in 2013.

Powered by large engines operating on high sulfur fuel, many ships emit high levels of fine particles (PM<sub>2.5</sub>) and sulfur dioxide (SO<sub>2</sub>), which are harmful to human health. In Sydney Harbour, the most fine particle emissions from ships come from cargo and industrial shipping categories (50%) (crude oil and petrochemical tankers, Ro-Ro and bulk and general cargo ships) and cruise ships (40%) as shown in Figure 3, and the great bulk of fuel consumption (64%) and SO<sub>2</sub> emissions (91%) occur when the vessels are at berth, as shown in Figures 4 and 5.

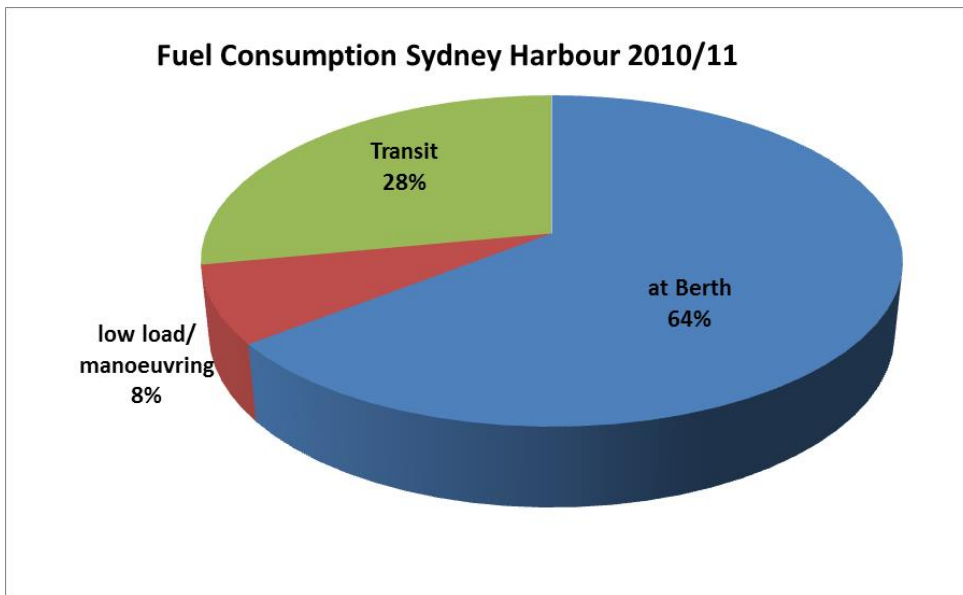
The report of a 2011 study for the EPA, [Potential Measures for Air Emissions from NSW Ports](#) (PAE Holmes 2011), gives further background on the contribution of shipping emissions to particle emissions and potential control actions.

**Figure 3: PM<sub>2.5</sub> emissions in Sydney Harbour 2010–11, shipping sources**

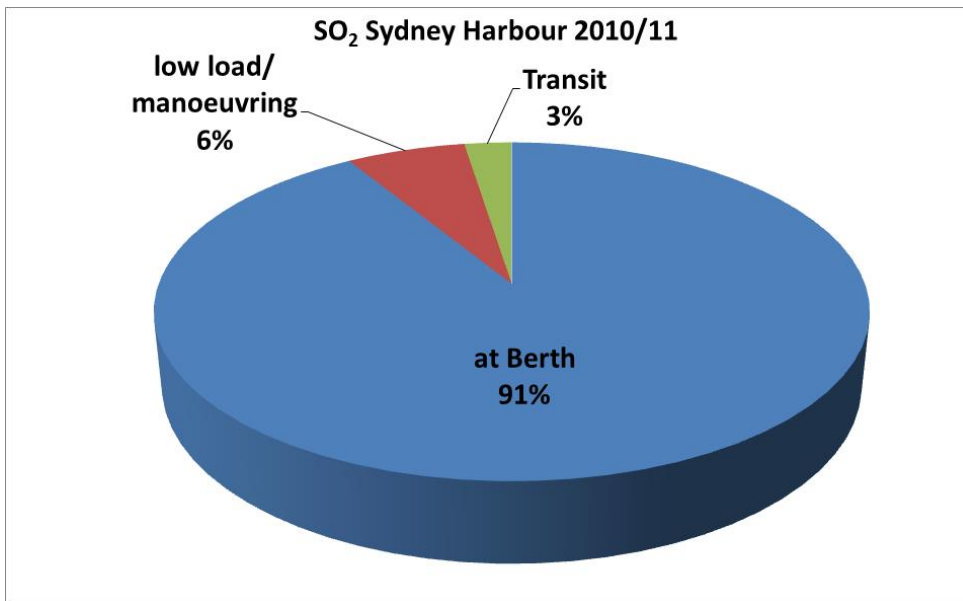


Source: [Goldsworthy 2014](#)

**Figure 4: Fuel consumption Sydney Harbour 2010–11, shipping sources**



**Figure 5: Sulfur dioxide emissions Sydney Harbour 2010–11, shipping sources**



Source: [Goldsworthy 2014](#)

Under the POEO Act and the POEO Clean Air Regulation 2010, the EPA has general powers relating to sulfur content of fuels. However, there are limitations in applying these to managing shipping emissions. The main instrument controlling shipping emissions is the International Convention for the Prevention of Pollution from Ships (MARPOL) enacted through Commonwealth legislation. Australia is a MARPOL signatory and implements its global requirements.

To protect air quality, MARPOL Annex VI sets limits for sulfur dioxide and oxides of nitrogen emissions from ship exhausts and sulfur in shipping fuel, currently 3.5% by weight. Fuel sulfur level limits are planned to reduce to 0.5% in 2020 or 2025, depending on a review of the availability of low sulfur fuel due for completion by 2018 (Table 1). Lower limits already apply in specified low sulfur emission control areas (SO<sub>x</sub> ECAs), (discussed in the Potential actions at national level section below).



**Table 1: MARPOL Annex VI fuel sulfur limits**

MARPOL Annex VI fuel sulfur limits		
Date	Sulfur limit in fuel (% m/m)	
	SOx ECA	Global
2000	1.50%	4.50%
2010	1.00%	
2012		0.10%
2015	0.50%	
2020 <sup>a</sup>		
a - alternative date is 2025, to be decided by a review in 2018		

Source: [ECOpoint 1997–2014](#)

## EPA actions

### *Shipping workshop and stakeholder engagement*

In November 2014, the EPA held a Shipping Emissions Management Workshop – specifically for cruise industry, containerised and bulk cargo industry, bulk fuel suppliers and ports authority stakeholders – to canvass issues and seek input to future solutions. The EPA Chair and CEO opened the workshop and over 80 stakeholders attended. Speakers presented on:

- Diesel and marine fuel emissions in NSW - sources and trends
- Exhaust emissions from ship engines in Australian waters
- Health impacts
- Management of sulfur emissions from an industry perspective
- Emissions reduction strategies.

Presentations from the workshop are available on the EPA website at [Cleaner Ports and Shipping](#).

The EPA continues to engage with the White Bay community representatives and government agencies. In December 2013, the EPA and NSW Health began regular inter-agency meetings on White Bay cruise terminal operations with the Department of Planning and Environment, the Port Authority of NSW and Leichhardt Council. Since April 2014 the group has included community representatives. A technical working party, established in May 2014 with members from the EPA and the Port Authority, provides support and oversight of investigations into mitigation measures.

### *Assessment of feasibility of shipping emissions reductions at ports in NSW*

To improve its evidence base and inform new control measures, the EPA has initiated a project to assess the technical feasibility, costs and emission impacts of potential emission reduction measures for ships at major ports in the NSW GMR. An international consultancy expert in shipping emissions, DNV GL, has been engaged to complete the project.



Stage 1 focuses on passenger cruise ships, and Stage 2 covers other shipping. The project includes:

- a stocktake and evaluation of all measures used nationally and internationally to reduce ship emissions, including broad policy instruments, economic instruments, management practices, technological options and voluntary measures
- an assessment of the logistical and technical feasibility of adopting lower sulfur fuel, improved on-board air filter systems (scrubbers), vessel speed reduction, and shore-side power for ships.

The consultants are gathering information from industry, including information to improve the estimates of costs and benefits of any proposals. The initial findings, due in early 2015, will inform new EPA strategies to reduce the impacts of fine particle and sulfur dioxide emissions from diesel/marine fuel exhaust.

### *Research health impacts of shipping emissions in the Sydney GMR*

NSW Health and the EPA are contributing to a study by the Centre for Air quality and health Research and evaluation (CAR), CSIRO and Australian Maritime College, to investigate the health impacts of PM<sub>2.5</sub> shipping emissions in the GMR. This project will model a range of scenarios in order to achieve a better understanding of the contribution by shipping emissions to PM<sub>2.5</sub> exposure and health impacts in Sydney Harbour and the GMR, and what improvement could be made through the use of low sulfur fuels.

### *Potential actions at national level*

Since 1 January 2010 the EU has required that ships burn fuel of 0.1 % sulfur content or less when they are at berth within EU ports or within EU inland waterways. MARPOL Annex VI also contains provisions for special SO<sub>x</sub> ECAs to be established with more stringent controls on sulfur emissions (Table 1 above). ECAs are in place for the Baltic Sea and the North Sea in Europe. In North America an ECA covers most of the US and Canadian coasts and the US Caribbean territories. Other areas may be added via the protocol defined in MARPOL Annex VI.

The Australian Marine Safety Authority is the Commonwealth agency which implements MARPOL in Australia. To establish an ECA under MARPOL in Australia, similar to those established in North America and Europe, would require significant research and would likely take a number of years to develop and be assessed by the International Maritime Organization.

The NSW Minister for the Environment has written to the Commonwealth Minister, seeking consideration of shipping emissions in the context of developing a National Clean Air Agreement, and the EPA has initiated discussions on shipping emissions with relevant Commonwealth departments. The National Clean Air Agreement is due for completion in 2016.

### *Future actions*

The EPA is committed to exploring options to reduce shipping emissions before 2020 through the implementation of feasible emission reduction measures for ships at ports in NSW.

The EPA will continue to investigate options for managing the impacts from shipping, including cruise ships and containerised and bulk cargo ships. Current research projects will assist in identifying health impacts and feasible options for implementation.

### ***Cruise shipping***

Specific options currently being investigated include:

- stricter fuel sulfur content limits for cruise ships berthed in Sydney Harbour
- the use of improved on-board air filter systems (scrubbers)
- scoping and decision on the introduction of shore side power for the White Bay passenger terminal within a specific agreed government timeframe, and mandating its use at berth by shore power equipped ships
- consideration of consistent requirements for the Overseas Passenger Terminal.

### ***Containerised and bulk cargo shipping***

Specific options currently being investigated include:

- a stocktake and evaluation of measures used nationally and internationally to reduce ship emissions. These include broad policy instruments, economic instruments management practices, technological options and voluntary measures
- an assessment of the logistical and technical feasibility of adopting lower sulfur fuel (including fuel switching), scrubbers, vessel speed reduction and shore side power for ships.

### **Milestones**

<b>Action</b>	<b>Date</b>
Complete feasibility of emissions reduction from shipping research project and hold public seminar	2 <sup>nd</sup> quarter 2015
Finalise timetable for identified actions, including any changes required to the regulatory framework	3 <sup>rd</sup> quarter 2015

## Evidence base for non-road diesel and marine emissions management

### Goal

- Improve the evidence base on diesel and marine emissions in NSW, options for managing emissions and health and economic drivers for emission reductions.

### EPA actions

#### *Update air emissions inventory findings*

The [NSW Air Emissions Inventory](#) is a key information source for the EPA in air quality management, including for prioritising sources and pollutants; developing and evaluating air quality programs; cost benefit analysis; environmental reporting; and modelling and forecasting. The inventory provides data on over 1,000 air pollutants from natural and man-made sources in the GMR, which includes Sydney, Newcastle and Wollongong and approximately 75% of the NSW population.

Inventories for the GMR have been compiled for the 1992, 2003 and 2008 calendar years. The EPA is currently compiling an inventory for the 2013 calendar year. The aim is to publish the 2013 inventory during 2016. The inventory findings for the 2013 calendar year will improve and update the EPA's evidence base on diesel and marine exhaust emissions, sources and impacts and assist in identifying priority areas for emissions management.

#### *Evaluate health impacts of different PM<sub>2.5</sub> sources and types*

The EPA and NSW Health have engaged CAR to review current scientific evidence in the international literature on health impacts of different sources, types and levels of particle pollution. The study focuses on particle sources to which the NSW population may be exposed, including coal-related and other industrial activities, wood heaters, on-road and non-road diesel sources and other transport, and hazard reduction burning. The findings will inform and help target EPA policy and regulatory actions to reduce exposure to particles, in particular PM<sub>2.5</sub>. It is expected the study will be completed and a public seminar held on the findings by May 2015.

### Milestones

Action	Date
Completion of research project into health impacts of different sources, types and levels of particle pollution and public seminar	2 <sup>nd</sup> quarter 2015
Update of GMR Air Emissions Inventory with 2013 emissions data	2016

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