



**Protection Of The  
Environment Operations  
(Clean Air) Amendment  
(Cruise Ships) Regulation  
2015  
Better Regulation Statement**

[www.epa.nsw.gov.au](http://www.epa.nsw.gov.au)

Environment Protection Authority

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Note: This Better Regulation Statement takes the place of a Schedule 1 Analysis and addresses the guidelines in Schedule 1 to the *Subordinate Legislation Act 1989* for the preparation of a Schedule 1 Analysis.

## 1. Executive summary

There is a high level of community concern regarding the localised health impacts of air emissions from ships berthed near urban populations.

In March 2015 the then Minister for the Environment, announced that the Government would require all cruise ships to use low sulfur fuel in Sydney Harbour by 1 July 2016 and earlier whilst at berth in Sydney Harbour.

It is proposed to amend the Protection of the Environment Operations (Clean Air) Regulation 2010 (the POEO regulation) to mandate the use of low sulfur fuel by cruise ships in Sydney Harbour in two stages:

- i) stage 1 – requiring the use of low sulfur fuel (0.1% or less) by cruise ships while berthed in Sydney Harbour from 1 October 2015
- ii) stage 2 – requiring the use of low sulfur fuel (0.1% or less) by cruise ships while in Sydney Harbour from 1 July 2016.

Under the *Protection of the Environment Operations Act 1997* (POEO Act) and the POEO Clean Air Regulation 2010, the Environment Protection Authority (EPA) has general powers relating to sulfur content of fuels.

The proposed fuel requirements would bring forward emission reduction actions that industry is required to undertake by 2020 or 2025 under an international shipping emissions protocol. Early action is required in Sydney Harbour due to the high sulfur levels of fuels currently used and their impacts on urban communities in close proximity to cruise terminals.

The proposed Regulation amendment would focus on Sydney Harbour. Cruise ship visits to Sydney Harbour constitute over 90% of all cruise ship visits to NSW ports. The EPA will consult with local communities in regional NSW ports before reconsidering a regulatory amendment requiring broader application of the low sulfur fuel requirements.

### 1.1 Proposed approach is proportionate to the policy problem

The proposed response measure focuses on a segment of shipping causing localised pollution around urban populations.

Cruise ships make over 250 visits to Sydney Harbour each year. Sources in the cruise ship industry forecast an 85% growth in annual port calls by 2025.

Requiring lower sulfur in marine fuel is a means of reducing emissions from ships that is widely applied in overseas jurisdictions and is the best option for achieving meaningful reductions in cruise ship emissions within the least time. Use of 0.1% sulfur heavy fuel oil would reduce fine particle emissions from cruise ships by 70%.

## 1.2 Outline of consultation approach and summary of stakeholder views

In developing the proposed Clean Air Regulation amendment, the EPA has consulted with key industry stakeholders, including the cruise line companies, cruise line peak industry association, fuel suppliers, and NSW Government agencies (Transport for NSW, Port Authority of NSW) on implementation issues. Consultation is also undertaken with the community through bi-monthly meetings of the Residents and Agencies Group for the White Bay Cruise Terminal. Public consultation on the draft Clean Air Regulation amendment was held from 2-15 June 2015.

A key theme from industry was the limited timeframe being made available for development of a response and the importance of harmonising with existing international shipping protocols. The cruise ship industry considered proposed at berth requirements better focused and more manageable than proposed requirements placed on broader in port operations. The main community concern was that potential health impacts would not be addressed in a timely manner.

## 1.3 Preferred option provides greatest net benefit

The net present value (NPV) of the preferred two stage approach outlined above is estimated to range from \$22.4 million to \$44.1 million. The benefit cost ratio of the preferred option is estimated to range from 3.5 to 3.9.

## 2. Need for government 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 the localised health impacts of air emissions from ships berthed near urban populations such as at White Bay passenger terminal in Sydney Harbour. White Bay passenger terminal began operating in April 2013.

There is a market failure to allocate the resource of clean air efficiently. Clean air is a public good and price signals fail to incorporate the true social benefits of clean air. A market intervention is justified to reduce the unintended effects of air pollution. The external cost of air pollution from cruise ships is not reflected in the price of marine fuel and there is no incentive to reduce the impact of fuel on pollution.

Powered by large engines operating on high sulfur fuel, many ships emit high levels of fine particles of less than 2.5 microns in diameter (PM<sub>2.5</sub>) and sulfur dioxide (SO<sub>2</sub>), both of which are harmful to human health. A 2011 EPA report shows that shipping emissions in ports in the NSW Greater Metropolitan Region are a source of 892 tonnes of particles per year.

In Sydney Harbour, cruise ships produce around 38% of total fine particle emissions from shipping. The great bulk of fuel consumption and associated emissions occur when ships are at berth. For general shipping in Sydney Harbour 64% of fuel consumption and 90% of sulfur dioxide emissions occur when vessels are at berth. Passenger ships' relative proportion of ship emissions at berth is higher than that of other vessel types.

Many management options to address shipping emissions are outside the direct control of state jurisdictions and are administered through Commonwealth legislation.

The International Convention for the Prevention of Pollution from Ships (MARPOL) is the principal convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. The *Protection of the Sea (Prevention of Pollution from Ships) Act 1983*, administered by the Australian Maritime Safety Authority, implements the MARPOL Convention in Australian waters. It includes provisions enacting MARPOL Annex VI, which sets limits on sulfur oxide and nitrogen oxide emissions from ship exhausts. The Annex VI definition currently excludes state waters.

Action to reduce ship emissions in NSW, particularly emissions near populated areas, lags behind emission reduction actions in North America, the European Union and parts of Asia. 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 the results of a review of the availability of low sulfur fuel, due for completion by 2018. However, lower sulfur limits of 0.1% already apply (from 1 January 2015) in emission control areas (ECAs) specified under MARPOL.

Areas currently covered by emission control areas are the North American coasts (including most of US and Canadian coasts), the US Caribbean (including Puerto Rico and the US Virgin Islands), Baltic Sea and North Sea. Countries/regions currently considering the introduction of emission control areas include Mexico and China/Hong Kong (Pearl River Delta).

In addition to MARPOL requirements European Union (EU) countries require 0.1% sulfur fuel for ships at berth in the EU from October 2010 if they do not use shore side electricity. Hong Kong requires use of 0.5% sulfur fuel by ships at berth from 1 July 2015.

By contrast, in the NSW greater metropolitan region (GMR) the average sulfur content of marine fuel is 2.7%. The equivalent sulfur standard for diesel vehicles is 10 parts per million (ppm) sulfur (0.001% sulfur).

The need for government action was recognised in March 2015 when the then Minister for the Environment stated that the Government was committed to ensuring that NSW residents have the same standard of protection from shipping emissions as that enjoyed by people in North America and Europe.

## **2.1 Potential impacts of not taking action**

Not effecting this commitment would result in ongoing and increasing health impacts for residents in the affected communities.

## **3. Objective of government action**

The objective of the proposed amendment to the Protection of the Environment Operations (Clean Air) Regulation 2010 is to reduce community exposure to the health impacts caused by particle pollution from cruise ships, by mandating the use of low sulfur fuel in NSW. The proportion of ship emissions from cruise ships at berth is higher than that of other vessel types (due to their higher energy requirements while at berth) and is emitted adjacent to residential populations.

Reducing PM<sub>2.5</sub> emissions is a priority due to its adverse health impacts. Those most affected are the elderly, children and those with existing health conditions. Health studies

show that there is no threshold concentration for exposure to particle emissions, below which health impacts are not observed. 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. Reducing sulfur in fuel is a key means to reduce fine particulate pollution.

Fuel standards which lower sulfur in marine fuel are a very cost effective means to quickly deliver emissions reductions and are the most common mechanism used to reduce PM<sub>2.5</sub> emissions from ships. Marine fuel standards are adopted through international agreement applied by Government, or directly by Government.

## 4. Options considered

The following options for meeting the stated policy objectives were considered. Options considered followed discussions with the cruise ship and fuel industry and the broader community through meetings and public consultation. An option initially proposed was to require, by regulation, use of ultra-low sulfur fuel in cruise ship auxiliary engines as soon as possible. This option was withdrawn following consultation with cruise ship companies which showed such a measure would not be effective. Only a very small proportion of cruise ships have or can use auxiliary engines to generate power while at berth.

### Option 1: Business as usual

In this scenario, ships would be required to comply with the MARPOL mandated 0.5% fuel sulfur limit for all shipping when it comes into effect. There would be no reduction in emissions from cruise ships until a new global standard is introduced in either 2020 or 2025. There would also be growth in overall cruise ship emissions in line with the projected growth of cruise ship visits. This option does not enable the government to meet its election commitment.

### Option 2: Require use of low sulfur fuel by cruise ships in Sydney Harbour

The option would address cruise ship emissions in the following two stages:

- i) stage 1 – requiring the use of low sulfur fuel (0.1% or less) by cruise ships while berthed in Sydney Harbour from 1 October 2015
- ii) stage 2 – requiring the use of low sulfur fuel (0.1% or less) by cruise ships while in Sydney Harbour from 1 July 2016. Use of alternative methods to achieve a reduction in sulfur emissions at least equivalent to what would be achieved by using low sulfur fuel (e.g. exhaust scrubbers and liquefied natural gas) would also be permitted under this option.

Requiring 0.1% sulfur marine fuel for cruise ships meets the Government commitment to provide similar marine fuel standards in Sydney Harbour as in the North American and European emission control areas and offers greater emissions reductions than the planned 2020 or 2025 MARPOL requirement to use 0.5% marine fuel for shipping everywhere.

### Option 3: Voluntary agreement

This option would develop a memorandum of understanding with the cruise ship peak industry body and government. Experience indicates that voluntary schemes for other sectors have largely failed to deliver beyond business as usual, particularly where there is

not broad industry uptake. This option is not expected to be effective due to industry concern about the lack of a level playing field as between it and the freight shipping industry and an emissions target would not be enforceable. This option does not enable the Government to meet its election commitment.

#### **Option 4: Establishing an Emission Control Area**

This option would seek to require use of 0.1% sulfur fuel by applying for emission control area status under MARPOL. This is the preferred international approach for controlling emissions other than at berth. Designation of an emission control area in Australian waters would need to be a Commonwealth led exercise and requires some detailed research. As a minimum, development of an emission control area application for Australia would be expected to take at least two to three years. The option could also be seen as not being a proportionate response to address specific concerns raised with impacts of emissions from cruise ships in NSW. Designation of an emission control area in Australian waters would apply to all shipping vessels.

#### **Option 5: Shore side power**

Establishing a shore-side power system on land and matching infrastructure on the largest polluting ships can significantly reduce local cruise ship emissions but has high capital costs and a very long lead time to establish. In particular, upgrading electricity grid infrastructure necessary for shore power alone would take 2-3 years. Infrastructure costs for shore-side power for cruise ships in Sydney Harbour are estimated to be around \$35-\$75 million. Refit cost would likely range from \$320,000-\$1.8 million per vessel. Currently around 19% of the over 50 cruise ships operating in NSW are shore side power capable (engines can take the power) but not shore side power 'ready' (plugs and adaptors need to be fitted on board). The Port Authority of NSW is the lead agency analysing options concerning development of landside infrastructure and operational procedures. This option does not enable the government to meet its election commitment.

## **5. Consultation**

The EPA held a workshop in June 2014 with key industry and community stakeholders as part of a broad program to address the impact of fine particle and diesel emissions from non-road diesel equipment, locomotives and shipping.

In November 2014 the EPA led an information forum with Australian and international representatives of the shipping industry, shipping associations and ports to help progress dialogue on reducing shipping air emissions.

In January 2015 the EPA released its Diesel and Marine Emissions Management Strategy covering actions to reduce emissions from all sectors. The Strategy was developed in response to the growth of non-road diesel and marine emission sources (in real terms and relative to on-road sources), increasing evidence of adverse health impacts, increased community concern, and the availability of feasible technologies to manage these emissions.

The EPA has also engaged an internationally recognised shipping consultancy to assess the technical feasibility, costs and emission impacts of adopting emission reduction measures for ships at major NSW ports. The consultants have sought information from stakeholders to inform estimates of costs and emission benefits of possible emission reduction options. The EPA has undertaken to consult with industry and the community on the findings of this consultancy in the second half of 2015.

Consultation is also undertaken with the community through bi-monthly meetings of the Residents and Agencies Group for the White Bay Cruise Terminal. This Group comprises representatives from the community, the Department of Health, Port Authority of NSW, Department of Planning and Environment, Leichhardt Council and the EPA.

The then Environment Minister wrote to the Commonwealth Minister for the Environment in 2014 seeking to have shipping emission issues considered nationally, given that shipping is an international industry governed by international agreements (e.g. MARPOL). NSW also raised this issue at the meeting of Environment Ministers in July 2015 and outlined potential mechanisms (e.g. designation of an emission control area in Australian waters) to address emissions from ships, particularly when not in port.

In developing the proposed Clean Air Regulation amendment, the EPA has consulted with key industry stakeholders, including the Cruise Lines Industry Association, Carnival Cruises, Royal Caribbean and fuel suppliers, Caltex and Viva Energy, on implementation issues.

Public consultation on the draft Clean Air Regulation amendment was held in June 2015. The draft regulation amendment has been updated to take account of this feedback where appropriate. Based on cruise ship industry concerns, exemptions, exceptions and defences to the draft regulation are as follows: Lack of local fuel supply would be a defence to stage 2 of the draft regulation if reasonable steps are taken to obtain compliant fuel. This defence is particularly relevant to regional ports, where compliant fuel is not readily available. It would be a defence to stages 1 and 2 of the draft regulation if safety concerns, technical problems, emergencies, unforeseen delays or unintended damage prevent compliance. The EPA may also exempt cruise ships from compliance with stages 1 and 2 of the regulation for safety reasons, and from stage 2 of the draft regulation if it is satisfied that compliance can only be achieved following mechanical modifications made in dry dock and that the next scheduled dry dock visit for a cruise ship is after 1 July 2016.

The draft regulation does not apply to cruise ships that are powered by gas. The EPA may also, on a ship-by-ship basis, approve an alternative to use of low sulfur fuel (such as exhaust scrubbing technology) as a means of compliance with the draft regulation, provided the net result is a reduction in sulfur emissions equivalent to what would be achieved using low sulfur fuel.

## **6. Preferred option**

### **6.1 Option 2: Require use of low sulfur fuel by cruise ships in Sydney Harbour**

Option 2 above is the preferred option. It would require cruise ships to use low sulfur fuel (0.1% or less) while berthed in Sydney Harbour by 1 October 2015 and expands this requirement to include cruise ships that are underway in Sydney Harbour from 1 July 2016. The initial at berth requirements capture most in-harbour cruise ship emissions.

The phrasing 0.1% “or less” is designed to account for the fact that cruise ships can use 0.001% sulfur fuel for limited periods, such as whilst they are at berth (and that supplies of such fuel are readily available), noting that the cruise ship industry’s preference for the reasons set out above is a regulation permitting use of 0.1% sulfur fuel.

The net present value of requiring low sulfur fuel at berth and in Sydney Harbour over next 20 years is summarised in Table 1, assuming universal compliance alternative MARPOL adoption dates to reduce sulfur in marine fuel to 0.5% in 2020 or 2025.

**Table 1: NPV of use of low sulfur fuel by cruise ships in Sydney Harbour (including at berth)(2015-2035)**

	<b>MARPOL 2020</b>	<b>MARPOL 2025</b>
<b>Sydney Harbour (including at berth)</b>	\$22.4m	\$44.1
Benefit cost ratio	3.5	3.9

If MARPOL does not introduce a 0.5% sulfur marine fuel, the net present value for the proposed regulation is estimated to be \$89.4 million.

Industry would face additional fuel costs as a result of the proposed fuel requirements, but mainly limited to the period up to 2020 or 2025 when the MARPOL 0.5% sulfur requirement comes into force. The substantive cost of removing sulfur from fuel lies in moving from the current high sulfur levels of up to 3.5% to the relatively low 0.5% or 0.1% sulfur levels. Costs of reducing from 0.5% to 0.1% are considerably lower. Emissions reductions attributable to the proposed amendments also reduce once a MARPOL 0.5% sulfur marine fuel limit is introduced in 2020 or 2025.

Additional flexibility is provided through allowance of alternative methods (e.g. exhaust scrubbers, liquid natural gas) to provide equivalent emissions reductions as achieved by 0.1% sulfur fuel. Exemptions from the requirement to use low sulfur fuel are based on industry feedback and are as set out above.

## 6.2 Sensitivity analysis

A sensitivity analysis was conducted for fuel price and health costs. If fuel price is increased by 50% the benefit cost ratio is reduced to a range of 2.3 - 2.6. If health costs for particles is reduced by 50% the benefit cost ratio range is reduced to 1.8 – 1.9.

## 6.3 Risk analysis

Advice from industry indicates that taking into account ships making frequent visits, 0.1% sulfur fuel can be used for 96% of port calls. However, if 0.1% sulfur fuel is not available in NSW the peak cruise industry association in Australia confirms its members' ships can instead operate on existing and available ultra-low sulfur distillate fuel (0.001%), but only for short periods (i.e. while at berth). In addition some cruise ships operate seasonally in Sydney Harbour and are able to source sufficient 0.1% sulfur fuel to meet proposed at berth fuel requirements for the whole season, on their return from the northern hemisphere. These ships make 24% of all Sydney cruise ship visits.

If 0.1% sulfur fuel is unavailable locally, emissions benefits should still be delivered by at berth fuel requirements through use of 0.001% sulfur fuel for 76% of cruise ship port calls and use of 0.1% sulfur fuel sourced overseas for 24% of port calls. PM<sub>2.5</sub> emissions from 0.001% sulfur distillate fuel are 90% lower than emissions from marine fuel currently used in NSW ports (2.7% sulfur fuel). In this scenario the present value of emissions reduction is \$31.4 million to \$50.4 million (only moderately lower than combined stage 1 and 2 emissions reductions) and the net present value is \$6.6 million to \$21.5 million. The benefit cost range is 1.3 to 1.7 and the estimated additional cost per passenger per voyage if extra fuel cost is fully passed on is around \$4.50.

## 7. Cost and benefits of options

Options concerning a voluntary agreement, establishing an emission control area or establishing a shore-side power system do not provide the certainty or fulfilment of an election commitment required for reducing emissions within a short timeframe and have therefore not been considered further at this time.

The costs and benefits of requiring use of low sulfur fuel by cruise ships in Sydney Harbour, as per the two stages outlined above and assuming universal compliance, relative to the base case of business as usual, are outlined below.

### 7.1 Option 1: Business as usual

Not taking action means the community's concerns will not be addressed, and will result in ongoing and increasing health impacts for residents in the affected communities until 2020 or 2025.

The principal environmental impact of the business as usual scenario would be an increase in PM<sub>2.5</sub> emissions until 2020 or 2025. The health costs of PM<sub>2.5</sub> emissions have been valued with reference to the 'Methodology for valuing the health impacts of changes in particle emissions' Aust N, Watkiss P, Boulter P and Bawden K (2013)<sup>1</sup>. This uses a damage cost approach (dollar per tonne approach) which incorporates and adjusts for Australian population densities. For example in Sydney the health impact of a tonne of PM<sub>2.5</sub> is around \$299,000 (in 2014 dollars).

Assuming MARPOL sulfur requirements are introduced in 2020 or 2025, total projected health impacts from cruise ship particle emissions in Sydney Harbour (including at berth) over the next twenty years range from a present value of \$109 million to \$126 million respectively. If MARPOL requirements are not introduced total health costs are \$159 million.

### 7.2 Option 2: Require use of low sulfur fuel by cruise ships in Sydney Harbour

Additional fuel costs are the main compliance cost for industry. Based on consultation with industry cruise ships capable of using 0.1% sulfur marine fuel in their main engines at berth represent 96% of cruise ship visits to Sydney Harbour. Using low sulfur fuel (0.1% or less) while berthed in Sydney Harbour is estimated to increase industry fuel costs by \$1 million for the 2016 calendar year. Use of low sulfur fuel while in Sydney Harbour from 1 July 2016 is estimated to increase industry fuel costs by \$1.6 million for the 2017 calendar year. These costs are 70% higher than current fuel prices for 3.5% sulfur marine fuel. Any ship modifications to meet stage 2 requirements are assumed to align and be part of standard scheduled dry dock maintenance and required in any event due to MARPOL.

Use of 0.1% low sulfur heavy fuel oil reduces PM<sub>2.5</sub> emissions by 70%. An annual health benefit from use of low sulfur at berth in Sydney Harbour in 2016 is estimated to be \$3.6 million. An annual health benefit for use of low sulfur fuel at berth and while in Sydney Harbour in 2017 is estimated to be \$5.7 million. Annual benefits (emissions reductions) attributable to the NSW Regulation reduce after 2020 or 2025 when MARPOL 0.5% fuel sulfur requirements come into effect.

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<sup>1</sup>Estimated using test methods In the NSW EPA Emissions Inventory

Fuel cost estimates are based on current marine fuel prices. The net present value and benefit cost ratio for implementation of Option 2, together with results of a sensitivity analysis on marine fuel price and emission health cost, are shown in the preferred option section.

### 7.3 Implementation and compliance

Record keeping and fuel sampling requirements for industry have been minimised by aligning with existing MARPOL requirements. Compliance is planned to be undertaken within the existing EPA budget. Compliance activities, including reviewing exemption applications and auditing of ships, would be substantively undertaken from 1 October 2015 until the MARPOL 0.5% global fuel sulfur limit comes into effect in 2020 or 2025. After this time, resources required would reduce by 50% and only one staff member would be required for compliance activities.

### 7.4 Competition impacts

Introduction of low sulfur fuel would have a small impact on business costs. In 2016, the use of 0.1% sulfur fuel at berth in Sydney Harbour would result in a \$2 additional cost per passenger per voyage if the increased fuel cost were fully passed on to cruise ship passengers. This is based on an average 250 cruise ship visits per annum and 2,000 passengers per ship.

## 8. Evaluation and review

The Regulation will be reviewed every five years in accordance with the *Subordinate Legislation Act 1989*. However, the EPA will keep in contact and obtain feedback from stakeholders as to the efficacy and efficiency of the draft Regulation. The proposed amendment can be updated in consultation with industry to enhance operation if required. In particular, the EPA will seek to ensure that the 0.1% sulfur marine fuel requirements align as much as possible with current international shipping obligations under MARPOL.