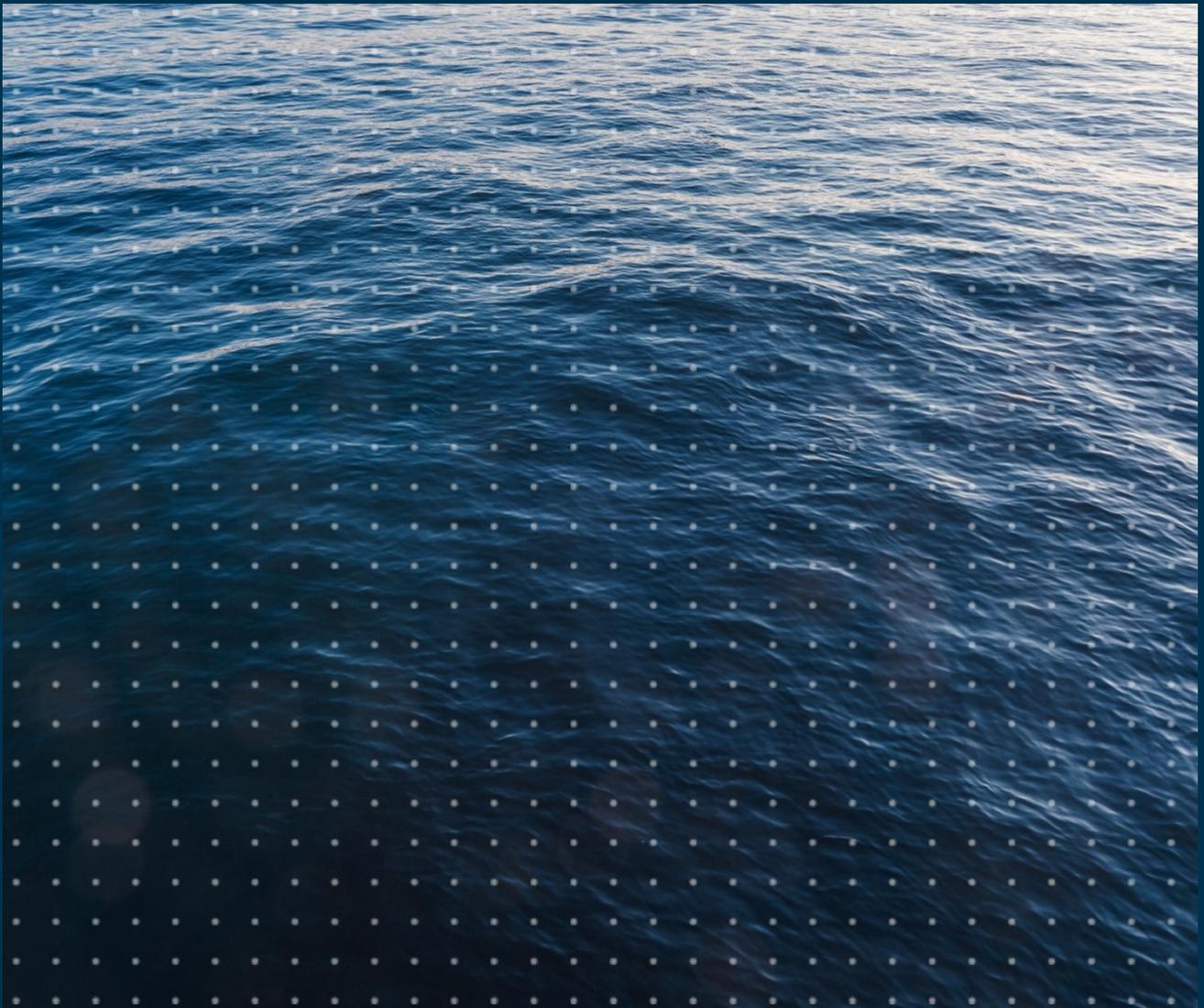




Environment Protection Authority

Regulatory Impact Statement

Protection of the Environment Operations (Clean Air) Regulation 2021



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Published by:

NSW Environment Protection Authority

4 Parramatta Square

12 Darcy Street, Parramatta NSW 2150

Locked Bag 5022, Parramatta NSW 2124

Phone: +61 2 9995 5000 (switchboard)

Phone: 131 555 (NSW only – environment information and publications requests)

Fax: +61 2 9995 5999

TTY users: phone 133 677, then ask
for 131 555

Speak and listen users:

phone 1300 555 727, then ask for 131 555

Email: info@epa.nsw.gov.au

Website: www.epa.nsw.gov.au

Report pollution and environmental incidents

Environment Line: 131 555 (NSW only) or info@epa.nsw.gov.au

See also www.epa.nsw.gov.au

ISBN 978 1 922447 85 2

EPA 2021P3380

November 2021

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1. Introduction

While clean air is fundamental to all people's health, air pollution particularly affects the health of children and older people. It also affects the natural environment and the liveability of communities.

The management of air quality in NSW uses an integrated whole-of-government framework that includes regulatory and non-regulatory measures. The goals of the framework are to:

- improve regional and local air quality by meeting the air quality standards set out in the National Environment Protection (Ambient Air Quality) Measure (Air NEPM)
- reduce the population's exposure to air pollution.

The Protection of the Environment Operations (Clean Air) Regulation 2021 (the Clean Air Regulation), which replaces the Protection of the Environment Operations (Clean Air) Regulation 2010, is the key regulatory mechanism in NSW for reducing emissions of harmful pollutants in the air. The Regulation provides regulatory measures for a number of disparate air quality issues. For example:

- residential emissions are controlled by targeting wood smoke and backyard burning
- motor vehicle emissions are addressed through pollution control devices on cars and measures addressing evaporative fuel emissions
- industrial emissions are controlled mainly by setting maximum emission concentration limits.

Purpose of this document

This document is a Regulatory Impact Statement (RIS) for the Clean Air Regulation, prepared in accordance with the *Subordinate Legislation Act 1989*.

When a regulation is to be made, the responsible agency must prepare a RIS that examines the economic and social costs and benefits of regulatory proposals and their alternatives.

As required, this RIS addresses the Better Regulation Principles for the regulation. To ensure the Regulation is appropriate, effective and efficient, the NSW Government has provided the Better Regulation Principles (NSW Treasury 2019) as a framework to determine that the regulation is required, reasonable and responsive to the economic, social and environmental needs of NSW.

Consultation

The Statute Law (Miscellaneous Provisions) Bill 2021 put before Parliament sought to postpone the automatic repeal of the Clean Air Regulation 2010 on 1 September 2021. This postponement was initiated due to the complexity of proposed amendments the NSW Environment Protection Authority (EPA) is progressing as part of a comprehensive review of the Regulation and to enable a genuine and thorough consultation with stakeholders.

The 12-month postponement of the Regulation was not able to occur through legislation due to the Covid-19 Delta variant outbreak in NSW.

Due to the specific circumstances of the case and that it was in the public interest for the Clean Air Regulation 2010 to remain in force, the following actions were taken. The Minister for Environment and Energy certified that the Clean Air Regulation 2021 was made in accordance with the requirements of the *Subordinate Legislation Act 1989* and the Minister administering the *Subordinate Legislation Act 1989* issued a certificate under s6(1)(b) of that Act which dispensed with the requirements to prepare and publicly consult on a RIS before the Clean Air Regulation 2021 was made. Instead, the EPA must prepare and consult on a RIS within 4 months of the Clean Air Regulation 2021 being made.

The EPA has now released this RIS outlining the minor and administrative amendments to the Clean Air Regulation. As the Regulation is already in force, submissions received will be considered during the comprehensive review of the Regulation. A subsequent regulation that will incorporate significant reforms will be made on or before 1 September 2022. The EPA will undertake consultation with stakeholders and the general community on these more significant reforms. This consultation phase will ensure that stakeholders have a detailed understanding of the proposed changes and allow for submissions to be received and considered by the EPA.

2. Background

The Clean Air Regulation contains provisions that support the objectives and implementation of the *Protection of the Environment Operations Act 1997* (POEO Act) as it concerns air quality. Those objectives include the reduction of risks to human health and the prevention of degradation of the environment.

The Clean Air Regulation sets standards for the emission concentration of designated pollutants by plant, equipment, activities (industrial and commercial), households and fuels. This is achieved by specifying limits on industrial emissions; prescribing requirements for storage of volatile organic liquids and fuels; addressing the standard of equipment (such as wood-fired heaters); and prescribing controls on motor vehicles and open burning.

It is complemented in its objective of improving air quality by the Protection of the Environment Operations (General) Regulation 2021, which uses licensing (including economic incentives through such mechanisms as load-based licensing) to improve air quality.

Air emissions

The six key air pollutants for which air quality standards are set are:

- carbon monoxide (CO)
- nitrogen dioxide (NO₂)
- sulfur dioxide (SO₂)
- lead
- photochemical oxidants (ozone, O₃)
- particles – specifically PM₁₀ (particles smaller than 10 microns (µm) in diameter) and PM_{2.5} (particles smaller than 2.5 µm in diameter).

Table 1 provides a summary of the most common pollutants targeted by the regulatory measures and concerns associated with exposure to these pollutants.¹

¹ CO and lead have not been included. This is because CO concentrations have continued to fall over the past 20 years due to changes in motor vehicle technology, and lead concentrations are also now low due to the ban on lead in petrol.

Table 1 Common pollutants dealt with under the Clean Air Regulation²

Definition of pollutant	Source of pollutant	Controls	Health impacts
<p>Particulate matter is liquid or solid particles suspended in the air. It can be a primary pollutant (from emissions) or a secondary pollutant (resulting from atmospheric reactions of primary pollutants). Particles are measured using their aerodynamic diameter and range in size from 0.001 to 500µm in diameter. Particles are categorised according to size because different sizes behave differently both in the atmosphere and in the human respiratory system.</p> <p>PM₁₀ includes all particulates that are 10µm or less in diameter. PM_{2.5} includes particulates that are 2.5µm or less in diameter.</p>	<p>Particles come from both natural and human sources and are generally visible as brown haze. They include acids, organic chemicals, metals, soil, dust and allergens. Human sources of particles include products of combustion and mechanical processes, such as emissions from motor vehicles, wood heaters, power plants and industrial processes.</p>	<p>Parts 2, 3, 4 and 5 of the Regulation.</p>	<p>Fine particles are more damaging to human health, as particles larger than 10µm do not usually enter the human respiratory system, so standards are built around PM₁₀ and PM_{2.5}.</p> <p>There is no safe concentration threshold for exposure to PM₁₀ or PM_{2.5} at which adverse health effects have not been observed.</p> <p>Short-term exposures to fine particles may result in respiratory symptoms (such as irritation of the airways; coughing and difficulty breathing); aggravated asthma; irregular heartbeat; heart attacks; and premature death in people with heart or lung disease. Long-term exposures may result in decreased lung function, the development of chronic bronchitis and increased cardiovascular risk.</p>

² A number of other pollutants are also controlled by the regulation. Scheduled industry must comply with emission limits for sulfur oxides, hydrogen sulfide, fluorine, chlorine, hydrogen chloride, cadmium, dioxins, furans and toxic metals. Sulfur dioxide is also controlled through limits on the sulfur content of fuel. Emissions of a range of air toxics are also controlled through requirements relating to wood heaters, backyard burning, industrial pollution control technology and anti-pollution devices in motor vehicles. The health benefits of these avoided emissions are not quantified to avoid double-counting as many health impacts are similar and not necessarily cumulative. As with the pollutants described above, there are also unquantified benefits for ecosystem health.

Definition of pollutant	Source of pollutant	Controls	Health impacts
Oxides of nitrogen (NO _x) are a group of gases including nitric oxide (NO) and nitrogen dioxide (NO ₂) that are generally produced by the combustion of fossil fuels. NO _x is significant due to its direct impacts on health but also as a precursor to ozone and secondary particle formation.	Electricity generation is a major source of NO _x in the NSW GMR. ³ Motor vehicles (petrol, diesel and off-road) are another major source, particularly in the Sydney region.	Parts 4 and 5 of the Regulation.	At low levels of exposure, NO _x can irritate the eyes, nose, throat and lungs, leading to coughing, shortness of breath, tiredness and nausea. Longer term exposure can destroy lung tissue, leading to chronic inflammatory lung disease. At high levels of exposure, NO _x can cause rapid burning, spasms and swelling of tissues in the throat and upper respiratory tract, reduced oxygenation of tissues, a build-up of fluid in the lungs, and maybe even death. Asthmatics and children are particularly susceptible.
Volatile organic compounds (VOCs) are a broad grouping of carbon-based compounds that vaporise at normal temperatures. VOCs as a group are significant as a precursor to the formation of ground-level ozone.	Exhaust and evaporative emissions of petrol from vehicles accounts for the largest proportion of VOC emissions. Other sources include combustion, surface coatings (paint), aerosols and solvents.	Parts 4 and 6: evaporative emissions Parts 2, 3 and 5: other emissions (controlling combustion)	General effects of exposure to VOCs include irritation to the eyes, nose and throat; headaches; loss of coordination; nausea; and damage to the liver, kidney and central nervous system. Some VOCs are also known or suspected to cause cancer in humans.

³ Greater Metropolitan Region. This term is used throughout this RIS, in place of Greater Metropolitan Area (GMA), which appears in the Regulation, because the modelling has been undertaken from a GMR perspective. The GMR results are deemed to be representative of the GMA.

The need for government action on air quality management

Clean air is fundamental to all people's health. Poor air quality in NSW affects the health of its people, particularly children and older people. It also affects the natural environment and the liveability of communities. Air quality is consistently a key environmental issue for the community (NSW EPA 2015).

The public health impacts and costs of air pollution and, conversely, the benefits of reducing people's exposure to air pollution are substantial. Air pollution leads to (NSW Government 2016):

- 520 premature deaths and 6,300 cumulative years of life lost in Sydney per year (Morgan, Broome & Jalaludin et al 2013)
- 1,180 hospital admissions in Sydney per year (Broome et al 2015)
- an estimated \$6.4 billion (2015 \$) in health costs per year in the NSW Greater Metropolitan Region (GMR) (DEC 2005).

Air quality in NSW is considered relatively good by world standards. There have been significant improvements since the 1980s as a result of programs and regulatory initiatives (including the Clean Air Regulation) that have reduced air pollution from industry, businesses, homes and motor vehicles.

Concentrations of some of the most common air pollutants – including carbon monoxide (CO), lead, sulfur dioxide (SO₂), particulate matter (PM) – consistently meet national air quality standards, except during extreme events, such as bushfires, hazard reduction burning and dust storms. Emissions of oxides of nitrogen (NO_x) and volatile organic compounds (VOCs), which contribute to ozone pollution, have been reduced by 30 to 40% across the Sydney region (NSW EPA 2015).

The pollutants of most concern are PM₁₀ airborne particles and, most significantly, the subgroup of finer PM_{2.5} particles (NSW Government 2016). Gaseous pollutants of concern include ozone (O₃), NO_x and SO₂. Some exceedances of the national standards – specifically for PM₁₀, PM_{2.5} and ozone – do occur.

Ground-level ozone is a secondary pollutant created by the chemical reaction between NO_x and VOCs in the presence of sunlight. High ozone can result from local emissions or precursors transported from other regions. Standards are exceeded mainly in the warmer months, when peaks coincide with high temperatures (NSW Government 2016).

Parts of regional NSW also face considerable challenges meeting the particle standards. Bushfires, the burning of agricultural residue, dust storms and wood heaters are the major emission sources in those regional areas.

Continuing improvement in air quality remains a challenge, particularly in the GMR, due to increases in population and numbers of motor vehicles, as well as economic growth. For example monitoring data indicate that reductions in CO and NO₂ have tailed off, possibly due to an increase in emission sources and an increase in emission contributions from unregulated sources (NSW Government 2016). Bushfires, dust storms and hazard reduction burning also periodically affect air quality in the GMR.

Current management framework for air quality

Air quality in NSW is managed through an integrated whole-of-government approach, using a mix of regulatory and non-regulatory measures. Air quality management is increasingly linked with efforts to reduce greenhouse gas emissions.

Air quality standards are set at the national level and are legally binding on each level of government. The standards (which are discussed below) are set by the National Environment Protection Council (NEPC) as part of the National Environment Protection (Ambient Air Quality) Measure (the Air NEPM).

The Air NEPM was released in 1998 and set goals and standards for specific pollutants. Those standards have been periodically reviewed and were last updated in 2016. Part 2 (National Environmental Protection Goal) has the desired environmental outcome of “ambient air quality that allows for the adequate protection of human health and well-being”. Part 3 (National Environmental Protection Standards) sets “standards that consist of quantifiable characteristics of the air against which ambient air quality can be assessed”.

The six key air pollutants for which standards are set are CO, NO₂, SO₂, lead, photochemical oxidants (ozone) and particulate matter (specifically, PM₁₀ and PM_{2.5}).

In 2021, the standards and goals of the Air NEPM were updated to take into account recent evidence on the health impacts of ozone (O₃), nitrogen dioxide (NO₂) and sulfur dioxide (SO₂) (see 2 and 3A and 3B). The changes included:

- establish an O₃ standard with an 8-hour averaging period that reflects the health evidence and its use internationally, with a numerical value of 65 ppb
- significantly strengthen NO₂ reporting standards for 1-hour and annual average NO₂ to 80 ppb and 15 ppb respectively, bringing forward standards initially proposed for 2025. This will make them tighter than the World Health Organization guidelines. This reflects the most recent health evidence emerging about the health impacts of NO₂
- significantly strengthen SO₂ reporting standards for 1-hour and 24-hour SO₂ to 100 ppb and 20 ppb respectively to make them some of the tightest in the world. The 1-hour SO₂ standard will be strengthened again in 2025 to 75 ppb
- remove annual SO₂ and 1-hour and 4-hour O₃ averaging periods to align the standards with the recent health evidence and for consistency with many international agencies
- change the form of the standards to the maximum value with no allowable exceedances providing the most transparency for reporting purposes
- apply the existing exceptional events rule that applies to the particle standards to O₃ given the linkages between elevated O₃ levels and fire events. This rule is used by jurisdictions to determine compliance with the standards
- extend annual reporting of population exposure from particles as PM_{2.5} to O₃ and NO₂, given the widespread exposure across whole populations.

Table 2 Air NEPM standards and goals

Pollutant	Averaging period	Maximum concentration standard
Carbon monoxide	8 hours	9.0ppm
Nitrogen dioxide	1 hour	0.08ppm
	1 year	0.015ppm
Photochemical oxidants (as ozone)	8 hours	0.065ppm
Sulfur dioxide	1 hour	0.10ppm
	1 day	0.02ppm
Lead	1 year	0.50µg/m ³
Particles as PM ₁₀	1 day	50µg/m ³
	1 year	25µg/m ³
Particles as PM _{2.5}	1 day	25µg/m ³
	1 year	8µg/m ³

Source: NEPC 1998

Additionally, there are further goals in place for PM_{2.5} particles and a standard for SO₂ in the NEPM (see Tables 3A and 3B).

Table 3A Goals for particles as PM_{2.5} from 2025

Pollutant	Averaging period	Maximum concentration by 2025
Particles as PM _{2.5}	1 day	20µg/m ³
	1 year	7µg/m ³

Source: NEPC 1998

Table 3B Standard for SO₂ from 2025

Pollutant	Averaging period	Maximum concentration by 2025
Sulfur dioxide	1 hour	0.075ppm

Source: NEPC 1998

NSW is a signatory to the national standards and goals for criteria air pollutants set by the Air NEPM. NSW has been working with other jurisdictions to update the standards by considering health impacts, leading international standards and World Health Organization guidance.

As discussed in Section 1, the POEO Act is the key piece of environment protection legislation setting the statutory frameworks for managing air quality in NSW. It is supported by the Clean Air Regulation and the Protection of the Environment Operations (General) Regulation 2021. The POEO Act and the two supporting Regulations are administered by the NSW EPA.

There is also capacity to control air emissions through land-use planning by one of the following means:

- approvals made under the integrated development process whereby an environment protection licence may be required for the development
- by local councils within the parameters of a local approvals policy, local environmental plan or development control plan.

The Clean Air Regulation provides regulatory measures for a number of air quality issues. These are outlined in Table 4.

Table 4 Air quality issues addressed by the Clean Air Regulation

Clean Air Regulation	Reason for regulatory measures
Domestic solid fuel heaters: Part 2	<p>Solid fuel heaters (wood heaters) generate particulate pollution that can cause significant health impacts, especially during winter. On an annual basis, wood smoke in Sydney contributes 25% of PM₁₀ and 36% of PM_{2.5} total particulate pollution from both natural and human sources (NSW EPA 2019). On a winter day, the contribution of PM₁₀ and PM_{2.5} particle pollution from wood smoke in Sydney can be as high as 67% and 81%, respectively (NSW EPA 2019). In colder climates – for example in Armidale – wood heaters can contribute over 85% of winter particle pollution (AECOM 2014). In addition to fine particles, wood smoke contains a number of VOCs, including known air toxics.</p> <p>Exposure to fine particulates is associated with a range of health issues, particularly respiratory and cardiovascular illnesses. It is associated with increased mortality and hospital admissions among people with heart and lung disease. In addition, there is evidence that exposure to VOCs is linked to cancer, birth defects, genetic damage, immune deficiency, and respiratory and nervous system disorders.</p>
Control of burning: Part 3	<p>The burning of waste, wood and vegetation in backyards and incinerators, referred to as ‘backyard burning’, was once widespread in NSW. Burning in the open or in inadequately controlled incinerators results in incomplete combustion, generating fine particles that are suspended in the atmosphere and may be transported over large areas, as well as VOCs, metals, polycyclic aromatic hydrocarbons (PAHs) and dioxins. Introduction of regulatory controls on backyard burning have reduced emissions of particles in Sydney by 99% over the past three decades (NSW Government 2011).</p>
Motor vehicles and motor vehicle fuels: Part 4	<p>Managing air emissions from motor vehicles and fuels remains a challenge in the NSW GMR. In Sydney, emissions from motor vehicles are estimated to make up 53% of emissions of NO_x, 9% of emissions of PM₁₀, and 10% of emissions of VOCs (45% of NO_x, 10% of VOCs, 7% of PM₁₀ and 8% of PM_{2.5} in the urban GMR), and each year Sydney exceeds national health based ozone targets (NSW EPA 2019). In Sydney, the number of kilometres travelled by passenger vehicles is increasing by approximately 1.0–1.5% per year, and freight travel is increasing by approximately 2–3% per year (NSW EPA 2019). This means that meeting the ground-level ozone and particle NEPM standards remains a challenge. Legislation at both state and federal levels has resulted in cleaner vehicles and fuels, which has made a significant difference to the levels of air pollution emitted from individual vehicles.</p>
Air impurities emitted from activities and plant: Part 5	<p>Emissions from activities (including industrial, agricultural or commercial activities) and plant (referred to as ‘industrial emissions’) are a major source of air pollution in NSW, significantly affecting ambient and local air quality. Even with existing controls, industry is responsible for approximately 85% of all anthropogenic emissions of particulate matter (PM₁₀), 57% of PM_{2.5} and 60% of the anthropogenic emissions of NO_x in the NSW GMR (NSW EPA 2019). Industry is also a principal source of air toxics in the region (NSW EPA 2019). These substances are associated with significant health and environmental effects.</p>

Clean Air Regulation	Reason for regulatory measures
Control of volatile organic liquids: Part 6	<p>Volatile organic liquids (VOLs) are organic compounds that exist as liquids at normal temperatures of use or storage. They have a high vapour pressure making them highly volatile with the potential to evaporate in ambient conditions.⁴ The production, consumption, storage or transport of VOLs in industries such as the petroleum, petrochemical, chemical and bulk storage industries can result in these vapours being released into the atmosphere as volatile organic compounds (VOCs), contributing to local, regional and global air pollution, particularly ozone. Each year Sydney exceeds national health-based ozone standards. Petrol also contains up to 1% benzene, which is a human carcinogen. There is no safe level of human exposure to benzene, long-term exposure to which has been linked to an increased incidence of leukaemia.</p>
Cruise ship fuels: Part 6A (2010 Regulation)	<p>Cruise ships generate emissions of SO₂, NO_x and particulate matter, largely as a result of the type of fuel used to power them. These emissions have the potential to affect the health of communities located close to ports and maritime activity. Current management of these emissions is aimed at reducing the level of sulfur in fuel, which generates SO₂ and particulate pollution when combusted.</p>

⁴ The Clean Air Regulation defines VOLs as liquids with vapour pressure of more than 3.44 kiloPascals.

3. Objectives of the Regulation

The Clean Air Regulation came into force on the 1 September 2021, incorporating the provisions of the Clean Air Regulation 2010 with only minor and administrative changes. This is an interim approach and the Regulation will need to be replaced by 1 September 2022. A more comprehensive review of the Clean Air Regulation is currently underway to ensure the requirements included remain effective into the future.

The Regulation replaces the Protection of the Environment Operations (Clean Air) Regulation 2010.

Based on the *NSW Government Guide to Better Regulation*, the changes are considered non-significant and have been assessed in accordance with the NSW Better Regulation Principles (Appendix A).

The minor changes include:

- repealing Part 6A – Cruise ship fuels, as amendments to Commonwealth legislation in 2016 made the NSW requirements inoperable.

The changes considered administrative in nature include:

- replacing ‘alpha’ numerical numbering with current style numbering
- inclusion of a ‘sunset clause’ – i.e. the date the Clean Air Regulation 2021 will be repealed
- removing repealed provisions
- removing savings and transitional provisions that are spent
- removing gendered language.

These changes have resulted in renumbering some clauses and schedules in the Regulation. Appendix B provides a comparison of clause and schedule references in the Clean Air Regulation 2010 and the Clean Air Regulation 2021 (i.e. it shows any new clause and schedule number for the same provision).

4. Options considered

Options considered for making the Regulation are:

- Option 1 – base case (business as usual); the Regulation is retained
- Option 2 – no Regulation case; the Regulation is repealed.

Option 1: base case ‘business as usual’ – retain the Regulation

Under the ‘business as usual’ option, the Regulation will continue with no change to current control measures in Parts 2 to 6 for wood smoke, open burning, motor vehicles and motor vehicle fuels, industrial emissions and volatile organic liquids. Table 5 summarises the impacts of retaining the controls in each Part of the Regulation.

Under Option 1, Part 6A of the Regulation – Cruise ship fuels which required cruise ships to use low-sulfur fuels in Sydney Harbour, is repealed. The Australian Government is responsible for the management of air emissions from shipping through the *Protection of the Sea (Prevention of Pollution from Ships) Act 1983* (Cwlth). Amendments to that Act (effective 1 January 2016) made inoperative the NSW powers to regulate low-sulfur requirements for shipping.

Table 5 Impacts of Option 1: retaining regulatory measures

Clean Air Regulation	Impact of retaining regulatory measures
Domestic solid fuel heaters: Part 2	<p>Minimum efficiency and emission limits for new solid fuel heaters sold in NSW (locally and imported), set in Australian Standards, apply:</p> <ul style="list-style-type: none"> heaters sold before 1 September 2019 must have at least 55% efficiency and 2.5 grams of particle emissions per kilogram of fuel burnt (g/kg). heaters sold on or after 1 September 2019 must have at least 60% efficiency and 1.5 g/kg.
Control of burning: Part 3	<p>Schedule 1 of the Regulation provides for three approaches to the control of burning by local governments:</p> <ul style="list-style-type: none"> Part 1 (highest level of control) – local government areas in which all burning (including burning of vegetation and domestic waste) is prohibited except with approval Part 2 (may permit burning of vegetation on rural lots that are not serviced by green waste collection) – local government areas in which burning of vegetation is prohibited except with approval Part 3 (may permit burning of domestic waste where there is no domestic waste collection service) – local government areas in which all burning (other than burning of vegetation) is prohibited except with approval.
Motor vehicles and motor vehicle fuels: Part 4	<p>State level controls on emissions from motor vehicles and their fuels apply that account for regional characteristics, such as the role that the geography and meteorology of the Sydney Basin plays in forming higher concentrations of ozone. These controls complement other non-regulatory and regulatory measures such as emission standards for new motor vehicles set in the Australian Design Rules and national fuel quality standards.</p> <p>NSW controls address:</p> <ul style="list-style-type: none"> smoky vehicles, which emit higher concentrations of pollutants than an average vehicle anti-tampering of pollution devices fitted by vehicle manufacturers petrol overfill protection supply of less polluting (“low volatility”) petrol between 15 November to 15 March each year, which reduces the amount of petrol vapour lost during petrol distribution, transfer to a motor vehicle at a service station, evaporating from a car’s petrol tank and emitted in a car’s engine exhaust.

Clean Air Regulation	Impact of retaining regulatory measures
Air impurities emitted from activities and plant: Part 5	<p>Supports the principal regulatory instrument, the POEO Act, for managing industrial emissions in NSW by setting maximum emission concentration standards for plant and activities operating on scheduled and non-scheduled industrial and commercial premises, including for emissions of particulates, NO_x, sulfuric acid mist, dioxins, furans, hydrogen sulphide, fluorine, hydrogen chloride and chlorine. The Regulation establishes:</p> <ul style="list-style-type: none"> • general standards of emission concentrations for all industry • specific standards of emission concentrations based on the type of industrial activity and the age of the plant and/or emission units • a process for reviewing emission concentration standards that apply to older plant in scheduled premises • performance standards for afterburners, flares and vapour recovery units. <p>Over time, emissions are expected to fall, reflecting that:</p> <ul style="list-style-type: none"> • certain older plant or emission units in some scheduled premises (currently classified as “Groups 3, 4 and 5”) are expected to undergo a major upgrade and will be required under the Regulation (clause 33) to improve emission control efficiency to meet ‘Group 6’ emission concentration standards • some activities, like power stations, are expected to cease operating • non-scheduled premises in the GMR, upon replacing an older emission unit (belonging to “Group A” or “Group B”), will need to meet more stringent emission limits (“Group C”).
Control of volatile organic liquids: Part 6	<p>Control equipment for plant and equipment used to produce, store, transport, distribute and consume VOLs is specified:</p> <ul style="list-style-type: none"> • vapour disposal units or vapour recovery units, covers and seals for large storage tanks • vapour collection systems for large loading plant, tank vehicles and underground storage tanks at service stations • fuel bowsers at service stations. <p>Types of control equipment and threshold sizes for their application are specified. Vapour recovery (VR) controls at petrol service stations include VR1 covering the transfer of petrol between underground storage tanks and road tankers, and VR2 which cover refuelling of vehicles. VR2 is now fully implemented by facilities across Sydney, Newcastle, Wollongong and the Central Coast.</p>

Option 2: No Regulation – repeal the Regulation

Under the no Regulation option, the Regulation is repealed and the regulatory controls for wood smoke, open burning, motor vehicles and motor vehicle fuels, industrial emissions and volatile organic liquids are removed. Table 6 summarises the impacts of removing the controls in Parts 2 to 6 of the Regulation.

Table 6 Impacts of Option 2: repealing regulatory measures

Clean Air Regulation	Impact of repealing regulatory measures
Domestic solid fuel heaters: Part 2	Councils could use planning instruments to control the installation of new wood heaters and open fireplaces in designated areas. Control of wood smoke would rely on providing information to the community, including targeted education for households on the correct use of wood heaters, periodic wood heater replacement programs run by local governments and the NSW Government and voluntary industry compliance with the Australian Standards. Industry have indicated their agreement to comply with the new standards and around 70% of Australian manufactured models of wood heaters already meet or are expected to meet the 60% heating efficiency and 1.5g/kg emission ('Tier 2') standards. However, full voluntary compliance by the entire industry is unlikely as commercial incentives do not exist for all suppliers and manufacturers (e.g. producers and importers of low-cost or export models).
Control of burning: Part 3	Absence of controls on open burning or the incineration of household waste or vegetation. Because of the convenience of domestic waste collection and recycling services and changes in community behaviour, it is unlikely that there would be an immediate and widespread return to the levels of backyard burning prevalent before controls were introduced if the Regulation was repealed. However, failure to continue the controls on burning could result in environmental deterioration as a proportion of the community becomes aware that restrictions no longer apply. Efforts by some councils to encourage more recycling by reducing waste collection services for general household waste may also lead to an increase in burning in the absence of the Regulation.
Motor vehicles and motor vehicle fuels: Part 4	Benefits from the regulatory controls over smoky vehicles, anti-pollution devices for light vehicles and requirements to supply low volatile fuel during summer will lapse. Requirements for heavy vehicles over 4.5 tonnes relating to emissions of smoke and the removal, disconnection or impairment of anti-pollution devices are covered by the Heavy Vehicle (Vehicle Standards) National Regulation 2013.
Air impurities emitted from activities and plant: Part 5	Regulated emission concentration standards would no longer be in place. Other mechanisms would be found to achieve the desired emission outcomes, most likely by incorporating the emission concentration standards in the environment protection licences of those premises. A number of pollution offences under the POEO Act could also be used to regulate both scheduled and non-scheduled premises. However, relying on enforcement as the primary regulatory option would become more challenging and resource intensive for both government and industry in the absence of a licensing regime, and would lead to a gradual deterioration in emission levels.
Control of volatile organic liquids: Part 6	<p>VOC emissions from some petroleum bulk storage facilities would be managed via standards currently included in their environment protection licences. However, there would be no alternative regulatory mechanisms for petrol service stations.</p> <p>VR1 would not significantly change at petrol stations as VR systems are often relied on to satisfy other requirements, such as workplace health and safety and fuel recovery requirements, and the emissions reduction requirements in load reduction agreements. For industries other than petrol stations, the VR1 could be removed or maintenance could decline over time, reducing effectiveness. VR2, which is designed to reduce emissions during vehicle refuelling, would be disabled at petrol stations to reduce operating costs.</p>

5. Costs and benefits

This section presents a comparison of the costs and benefits of the base case, retaining the Regulation (Option 1), incrementally to the no regulation case (Option 2). As the timing of the costs and benefits varies over time, they are compared as present values over a 20-year period (2021-2041) at a 7% discount rate.

Net benefits/(costs) are summarised in Table 7. A discussion of the benefits and costs for each Part of the Regulation is provided in Table 8.

The analysis shows a net benefit to the NSW public and economy from retaining the Regulation (Option 1) from avoided health costs due to reduced levels of air pollutants achieved from the existing regulatory controls. These include reduced particulates from wood heaters and open burning, reduced NOx and VOC emissions from motor vehicles and motor vehicle fuels, reduced particulate and NOx emissions from industry, and reduced VOC emissions from volatile organic liquid storage and distribution.

Conversely, repealing the Regulation (Option 2) results in a net cost, being the loss of health benefits provided by avoiding emissions of air pollutants. The benefits of regulatory measures outlined in Tables 7 and 8 would not accrue, and the associated costs would not be incurred, if the Regulation was repealed.

Table 7 Summary of net benefits

Clean Air Regulation	Option 1 (Net present value, \$m)
Domestic solid fuel heaters: Part 2	413.18
Control of burning: Part 3	0.36
Motor vehicles and motor vehicle fuels: Part 4	
- Smoky vehicles	3.70
- Summer petrol volatility	126.17
Air impurities emitted from activities and plant: Part 5	692.36
Control of volatile organic liquids: Part 6	
- Large storage tanks	0.13
- Petrol stations	392.25
Cruise ship fuels: Part 6A (2010 Regulation)	Not analysed as federal laws override the Clean Air Regulation and made Part 6A inoperable.

Table 8 Benefits and costs of retaining the Regulation (Option 1) compared to repealing the Regulation (Option 2)

Clean Air Regulation	Benefits	Costs
Domestic solid fuel heaters: Part 2	<ul style="list-style-type: none"> • Lower emissions of PM_{2.5} ranging from 44 to 142 tonnes per year over the 20-year analysis period (based on a 35-year life for a wood heater). The avoided PM_{2.5} emissions per year are relatively small due to the long life of wood heaters and a relatively slow replacement rate. <i>If minimum standards are removed, a return of wood heaters with poorer emissions control could be seen over the longer term. Repealing the Regulation might not lead to an increase in wood heater numbers, but could lead to an increase in emissions and, therefore, increased health costs (the reverse of the health benefits).⁵</i> • Health benefits of \$10.6 million in the first year, increasing to approximately \$394.8 million (in present value terms) over the analysis period (2021-41). Damage costs of PM_{2.5} (on a \$/tonne basis) are very high relative to other pollutants. The health benefits associated with even small reductions in PM_{2.5} emissions are therefore substantial. • Avoidance of other emissions (even if in small quantities), such as VOCs leading to improved visibility, less offensive odours and a generally improved condition of the built and natural environment. These costs are currently unquantified. 	<ul style="list-style-type: none"> • Costs to government (state and local) estimated at \$15,000 per year for administration and enforcement of emission standards (AECOM 2014). <i>The repeal of minimum standards would still result in costs to government, including for alternative regulatory measures to reduce emissions. It is difficult to know what those costs would be because the types of measures that would be needed are not known.</i>

⁵ An inventory of existing wood heaters established for the purpose of the analysis indicates that, over time, there is expected to be a decline in the number of wood heaters in the NSW GMR, based on the analysis of historical trend.

Clean Air Regulation	Benefits	Costs
Control of burning: Part 3	<ul style="list-style-type: none"> • Lower particulate matter emissions, leading to improved human health. Estimated for the Sydney region to be about 5 tonnes per year of PM₁₀, of which approximately 4.75 tonnes per year is PM_{2.5}. • Health benefits of the avoided PM_{2.5} conservatively estimated at around \$257,000 per year (<i>assume that current waste management practices would act as a control on increased burning, at least for a significant period</i>). • Sustainability in waste management practices. The Regulation has supported the development of a range of sophisticated waste management and recycling services, with flow-on economic development gains. • Other unquantified benefits including reductions in odours, smoke and ash, air toxics, accidental fires and greenhouse gas emissions, and improved amenity in natural and built environments. 	<ul style="list-style-type: none"> • Minor unquantified cost to the EPA and local councils to issue approvals and notices related to allowed burning. • Costs to councils of administering the Regulation estimated at \$187,000 per year.⁶ Costs vary among councils depending on local policies (for example some councils require residents to submit an application for each proposed open burn, while others have a standing approval for burning on rural lots but prohibit this type of burning in residential-zoned areas). <i>The repeal of open burning controls may lead to an increased reliance on alternative regulatory mechanisms that are already in place. As for wood heaters, other regulatory mechanisms that have the potential to control burning to some extent are the Local Government Act and the POEO Act.⁷ However, most of those controls cannot be used proactively to prevent backyard burning (particularly by limiting the locations and types of substances being burned) and may increase the costs of local councils in dealing with domestic burning. The extent to which they may be used successfully is speculative and cannot be assessed quantitatively.</i> • Waste collection costs to residents.

⁶ Total estimated local government costs to be equivalent of two full-time employees across all councils listed on the schedules, including on-costs.

⁷ Through the use of prevention notices, orders prohibiting burning in certain weather conditions, and orders to extinguish a fire (sections 96, 133 and 134 of the POEO Act).

Clean Air Regulation	Benefits	Costs
<p>Motor vehicles and motor vehicle fuels: Part 4</p>	<p>Smoky vehicles and anti-pollution devices</p> <ul style="list-style-type: none"> • Increase of 0.23 tonnes of NOx emissions, 0.17 tonnes of VOCs emissions and 1.7 tonnes of PM₁₀ emissions, compared to current emissions under the Regulation. • Avoided health costs of approximately \$5 million (present value) over 20 years due to the decrease in emissions of pollutants from vehicles repaired in response to infringement notices or notices to repair a smoky vehicle. 	<p>Smoky vehicles and anti-pollution devices</p> <ul style="list-style-type: none"> • Costs to government of enforcing the smoky vehicle and anti-tampering provisions of approximately \$1 million over 20 years, including staff salaries and on-costs, provision of vehicles for use in enforcement activities, stationery and postage, the administration of the website reporting system, training of authorised officers and prosecutions. • Costs to motorists of having to undertake repairs to rectify smoky vehicles (for example, tuning, filter replacements, new injectors and possibly engine reconditioning for diesel vehicles; retuning, head gasket replacement and possibly engine reconditioning or rebuilding for petrol vehicles). Where defective vehicle notices are issued, vehicle owners must undertake the necessary mechanical repairs or risk having the vehicle registration cancelled. Penalty infringement notices may also be issued for smoky vehicles. To comply with the anti-tampering provisions, vehicle owners must repair vehicles found to have their emission systems altered.

Clean Air Regulation	Benefits	Costs
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- Summer petrol volatility limits
- Lower VOC emissions with estimated benefits of \$148.29 million over 20 years including:
 - less ozone at ground level and less damage to human health
 - less fuel lost to the atmosphere, with savings to motorists and petrol distributors.

- Summer petrol volatility limits
- Costs to government for monitoring compliance and enforcement activities estimated at \$58,505 per year.
 - Operating cost to the petroleum industry (domestic refineries and importers) of \$21.5 million over 20 years for supplying lower volatility petrol, being forgone revenue from having to extract butane to meet the summer volatility limit from its highest value end-product (petrol) and:
 - using it to produce alkylated/blended fuel products or liquefied petroleum gas (LPG), and/or
 - selling it into the petrochemical or export market.

Cost implications are dependent on prevailing oil prices and exchange rates. Available information suggests only a very small proportion of the butane (<1%) is redirected to a low-value use. Most goes either to alkylation/blending (no loss in value) or to LPG production (small loss in value).

On average those costs are estimated to be about 0.09 cents/litre for domestically produced petrol (approximately 20% of all petrol consumed in the GMR). There is zero impact on imported petrol as the volatility of gasoline imported from efficient, large-scale export refineries in Asia typically meets the NSW summer petrol volatility limit throughout the year (Fueltrac 2018).

Air impurities emitted from activities and plant: Part 5

- Lower emissions of PM_{2.5} and NO_x from scheduled premises.
- Health benefits from reduced PM_{2.5} and NO_x of \$676.46 million over 20 years.
- Reduced emissions of other pollutants, with associated health benefits (not quantified).

- Monitoring and enforcement costs for government. *These costs are estimated to be higher by around \$16.89 million over 20 years if the Regulation is repealed and alternative mechanisms are used to achieve the desired emission outcomes.*

Clean Air Regulation	Benefits	Costs
Control of volatile organic liquids: Part 6	<p>Large storage tanks</p> <ul style="list-style-type: none"> • Lower VOC emissions resulting in avoided health costs of \$0.11 million over 20 years. <p>Petrol stations</p> <ul style="list-style-type: none"> • Lower VOC emissions resulting in avoided health costs of \$338 million over 20 years. • Industry savings of \$65.48 million over 20 years from recovered petrol vapours. • Additional unquantified benefits include direct impacts on the amenity (odour) of petrol stations and the health of their employees and people living and working nearby, and the reduction in air toxics such as benzene. <p><i>Air quality would deteriorate and health benefits would be lost if the Regulation was repealed as there would be no alternative regulatory mechanisms for petrol stations.</i></p>	<p>Large storage tanks</p> <ul style="list-style-type: none"> • No costs to government or industry. <p>Petrol stations</p> <ul style="list-style-type: none"> • Operating cost to industry of \$10.96 million over 20 years. These costs are more than offset by the value of recovered product.
Cruise ship fuels: Part 6A (2010 Regulation)	<p>The Australian Minister for Infrastructure and Transport issued directions under the <i>Navigation Act 2012</i> requiring that, from 1 December 2016, cruise ships use fuel with 0.1% or less sulfur when at berth in Sydney Harbour. This mirrored previous NSW at-berth requirements. The limits are monitored in Sydney Harbour by the Australian Maritime Safety Authority. Repealing Part 6A of the Regulation will not result in any change to the status quo and will be cost and benefit neutral.</p>	

6. Conclusion

Option 1, retaining the Regulation, is preferred to Option 2, repealing the Regulation, as it provides material net benefits to society and the NSW economy from avoided health impacts of air pollution.

Retaining the Regulation means that the substantial cumulative reductions in emissions of particulates, NO_x, VOCs and other air pollutants that have already been achieved will be sustained and emissions will remain below the levels that would be expected if the Regulation was repealed.

Appendix A: Better Regulation Principles

Better Regulation Principles		
Principle 1	The need for government action should be established. Government action should only occur where it is in the public interest, that is, where the benefits outweigh the costs.	Section 2
Principle 2	The objective of government action should be clear.	Section 3
Principle 3	The impact of government action should be properly understood by considering the costs and benefits (using all available data) of a range of options, including non-regulatory options.	Section 4, 5
Principle 4	Government action should be effective and proportional.	Section 4, 5
Principle 5	Consultation with business and the community should inform regulatory development.	Section 1
Principle 6	The simplification, repeal, reform, modernisation or consolidation of existing regulation should be considered.	Section 4, 5
Principle 7	Regulation should be periodically reviewed and, if necessary, reformed to ensure its continued efficiency and effectiveness.	Section 1

Appendix B: Changes to the Regulation

Changes to the Clean Air Regulation are minor and administrative in nature only, such as removing spent provisions. This has resulted in renumbering some clauses and schedules. Part 6A requiring cruise ships to use low-sulfur fuels in Sydney Harbour has been repealed as amendments to Commonwealth legislation in 2016 made NSW requirements inoperable. A complete list of renumbered clauses and schedules in the Regulation is given in Table B1.

Table B1 Complete list of renumbered clauses and schedules

2021 Regulation clause		2010 Regulation clause
Part 1 – Preliminary		
1	Name of Regulation	1
2	Commencement	2
3	Definitions	3
Part 2 – Domestic solid fuel heaters		
4	Definitions	4
5	Application Part	5
6	Requirement for certificates of compliance when heaters are sold	6
7	Interference with heaters	7
Part 3 – Control of burning		
8	Definitions	8
9	Application of Part	9
10	General obligation to prevent or minimise pollution	10
11	Prohibition on burning certain articles	11
12	Offences	12
13	Approval of certain fires or incinerators	13
Part 4 – Motor vehicles and motor vehicle fuels		
14	Definitions	14
15	Excessive air impurities	15
16	Motor vehicles emitting excessive air impurities	16
17	Prescribed anti-pollution devices	17
18	Fitting of certain anti-pollution devices to be compulsory	18
19	Complying exhaust pipe not required for certain vehicles	19
20	Exemption from offence relating to sale of motor vehicles	19A
21	Maintenance of vehicles	20
22	Use of motor vehicles requires anti-pollution device	21
23	Maintenance, service and adjustment of motor vehicles	22
24	Removal or adjustment of anti-pollution devices	23

2021 Regulation clause		2010 Regulation clause
25	Exemption from offence against section 157	23A
-	Notices to repair motor vehicles <i>Repealed</i>	24
26	Transfer of petrol into fuel tanks of motor vehicles	25
27	Definitions	26
28	Monthly volumetric average vapour pressure	27
29	Vapour pressure of petrol	28
30	Record keeping	29
31	Reporting	30
Part 5 – Air impurities emitted from activities and plant		
32	Definitions	31
33	General grouping of activities and plant	32
34	Emission units taken to be in Group 6	33
35	Phasing out of Group 1	34
36	Phasing out of Group 2	35
37	Alternative standards imposed by licence conditions	36
38	Determination of application for variation of licence	37
39	Prescribed standards of concentration for air impurities	38
40	Determining whether standards have been exceeded	39
41	Dioxins and furans	40
42	Approved circumstances in relation to smoke emissions	41
43	Alternative standard for hydrogen sulphide emissions	42
44	Grouping of activities and plant	43
45	Prescribed standards of concentration for air impurities	44
46	Determining if standards have been exceeded	45
47	Approved circumstances in relation to smoke emissions	46
48	Definition	47
49	Application of Division	48
50	Operation of Group 6 treatment plant	49
51	Residence time	50
52	Combustion temperature	51
53	Destruction efficiency	52
54	Emissions points	53
55	Combination of air impurities from 2 or more sources	54
56	Standards of concentration not to affect other controls	55
57	Exemptions relating to start-up and shutdown periods	56
58	Exemptions relating to emission of smoke	57

2021 Regulation clause		2010 Regulation clause
59	Exemption relating to emergency electricity generation	57A
60	Limits on sulfur content of liquid fuel	58
Part 6 – Control of volatile organic liquids		
61	Definitions	59
62	Equipment and plant to be fitted with control equipment	60
63	Exemptions from requirement for control equipment	61
64	Application	62
65	Control equipment for large storage tanks	63
66	Control equipment for large loading plant	64
67	Control equipment for small storage tanks	65
68	Control equipment for large tank vehicles	66
69	Loading and unloading large tank vehicles	67
70	Definitions	68
71	Control equipment for storage tanks on petrol service stations	69
72	Specifications regarding covers	70
73	Specifications regarding periodic testing	71
74	Control equipment for petrol dispensers	72
75	Specifications regarding testing	73
76	Specifications regarding monitoring	74
77	Reporting to the EPA	75
78	Compliance notification	76
79	Log books	77
80	Exemptions	78
Part 6A – Cruise ship fuels <i>Repealed</i>		
-	Definitions	78A
-	Cruise ships to use low sulfur fuel while berthed in Sydney Harbour	78B
-	Cruise ships to use low sulfur fuel while within the boundaries of Sydney Harbour	78C
-	Defence relating to availability of fuel	78D
-	Defence of master reasonably acting under order or direction of owner	78e
-	Defences relating to special circumstances	78F
-	Exemptions relating to ship safety and dry dock scheduling	78G
-	Exception for use of LNG, CNG and LPG	78H
-	Fuelling supplier obligations	78I
-	Log books and other records	78J
-	Fuel samples to be kept	78K

2021 Regulation clause		2010 Regulation clause
-	Master or appropriate officer to remain on cruise ship while berthed in Sydney Harbour	78L
-	Application for approval	78M
-	Granting of approval	78N
-	Revocation and suspension of approvals	78O
-	Variation of approval	78P
-	Effect of approval	78Q
-	Appeals against certain decisions	78R
Part 7 – Miscellaneous		
81	Savings	79
82	Repeal	-
Schedule 1	Local government areas in which burning is prohibited	Schedule 8
Schedule 2	Standards of concentration for scheduled premises – afterburners, flares and vapour recovery units	Schedule 2
Schedule 3	Standards of concentration for scheduled premises – activities and plant used for specific purposes	Schedule 3
Schedule 4	Standards of concentration for scheduled premises – general activities and plant	Schedule 4
Schedule 5	Test methods, averaging periods and reference conditions for scheduled premises	Schedule 5
Schedule 6	Standards of concentration for non-scheduled premises	Schedule 6
Schedule 7	Test methods, averaging periods and reference conditions for non-scheduled premises	Schedule 7

Appendix C: Cost-benefit calculations

General assumptions

Several general assumptions have been applied in this RIS. They include the analysis base year, the base year for valuation (of costs and benefits), the discount rate applied to costs and benefits over time, the evaluation period and the health damage costs associated with the pollutants considered.

The general assumptions for the cost–benefit analysis (CBA) are outlined in Table C1.

Table C1 General assumptions

Variable	Assumption
Base year	FY 2020
Prices	FY 2018
Evaluation period	FY 2021 – FY 2041
Discount rate	7% (real)
Health damage cost PM _{2.5} : GMR	\$261,521 (FY 2021) – \$335,203 (FY 2041) (excluding uplift factor)
Health damage cost PM _{2.5} : non-GMR	\$44,949 (FY 2021) – \$49,007 (FY 2041) (excluding uplift factor)
Health damage cost NO _x : GMR	\$7,006 (FY 2021) – \$9,787 (FY 2041) (excluding uplift factor)
Health damage cost NO _x : non-GMR	\$958 (FY 2021) – \$1,338 (FY 2041) (excluding uplift factor)
Health damage cost VOCs: GMR	\$5,288 (FY 2021) – \$6,777 (FY 2041) (excluding uplift factor)
Health damage cost VOCs: non-GMR	\$719 (FY 2021) – \$784 (FY2041) (excluding uplift factor)
Health damage cost: annual uplift factor	0.9%

References

- AECOM 2014, *Wood smoke control measures: Cost benefit analysis*, State of NSW and Environment Protection Authority, Sydney.
- Broome RA, Fann N, Navin Cristina TJ, Fulcher C, Duc H & Morgan G 2015, The health benefits of reducing air pollution in Sydney, Australia, *Environmental Research*, 143:19–25.
- DEC (Department of Environment and Conservation) 2005, *Air pollution economics: Health costs of air pollution in the Greater Sydney Metropolitan Region*, DEC, Sydney, <https://www.environment.nsw.gov.au/research-and-publications/publications-search/air-pollution-economics-health-costs-of-air-pollution-in-the-greater-sydney-metropolitan-region>
- Fueltrac 2018, *Advice for NSW EPA: Gasoline RVP*, prepared 10 May 2018.
- Morgan, G, Broome, R & Jalaludin, B 2013, *Summary for policy makers of the health risk assessment on air pollution in Australia*, prepared for the National Environment Protection Council, Canberra.
- NEPC (National Environment Protection Council) 1998, National environment protection measure and revised impact statement for ambient air quality, NEPC, Canberra.
- NSW EPA (NSW Environment Protection Authority) 2015, *NSW state of the environment 2015*, NSW EPA, Sydney, <https://www.epa.nsw.gov.au/about-us/publications-and-reports/state-of-the-environment/state-of-the-environment-2015>
- NSW EPA (NSW Environment Protection Authority) 2019, Air emissions inventory for the Greater Metropolitan Region in New South Wales: Consolidated natural and human-made emissions – Results, NSW EPA, Sydney.
- NSW Government 2011, *Air pollution: Particulate matter PM_{2.5}*, Office of Environment and Heritage, Sydney, June, www.epa.nsw.gov.au/resources/air/110456Airpollution.pdf
- NSW Government 2016, *Clean air for NSW: consultation paper*, NSW Environment Protection Authority and Office of Environment and Heritage, Sydney, <http://www.epa.nsw.gov.au/your-environment/air/clean-air-nsw>
- NSW Treasury 2019, *NSW Government Guide to Better Regulation, Policy and Guidelines Paper TPP 19-01*, NSW Treasury, available from www.productivity.nsw.gov.au/better-regulation

Acronyms and abbreviations

CO	carbon monoxide
EPA	Environment Protection Authority
g/kg	grams per kilogram
GMA	Greater Metropolitan Area, which incorporates Sydney, the Illawarra and Newcastle
GMR	Greater Metropolitan Region
LPG	liquefied petroleum gas
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NO ₂	nitrogen dioxide
NO _x	oxides of nitrogen
O ₃	ozone
PAH	polycyclic aromatic hydrocarbon
PM	particulate matter
POEO Act	Protection of the Environment Operations Act 1997
RIS	regulation impact statement
SO ₂	sulfur dioxide
µg/m ³	micrograms per cubic metre. 1µg = 1 millionth of a gram
µm	micrometre or micron. 1µm = one thousandth of a millimetre
VOC	volatile organic compound
VOL	volatile organic liquid
VR	vapour recovery
VR1	stage one vapour recovery
VR2	stage two vapour recovery