Summary of Public Submissions and National Environment Protection Council Response

Variation to the National Environment Protection (Ambient Air Quality) Measure

April 2021

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April 2021

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Glossary

Abbreviation	Definition
AAQ	ambient air quality
AS/NZS	Australian standard / New Zealand standard
CBA	cost–benefit analysis
CO	carbon monoxide
DEO	desired environmental outcome
EU	European Union
Euro VI	European emission standards VI for light vehicles
FGD	wet flue gas de-sulfurisation
GRUB	generally representative upper bound
HRA	health risk assessment
MCA	multi-criteria analysis
MW	megawatts
NATAG	National Air quality Technical Advisory Group
NEPC	National Environment Protection Council
NEPC Act 1994	*National Environment Protection Council Act 1994*
NEPM	National Environment Protection Measure
NO_2	nitrogen dioxide
NSW	New South Wales
NZ	New Zealand
O_3	ozone
Pb	lead
PM	particulate matter
PM_{10}	particulate matter with a diameter of less than 10 micrometres
$PM_{2.5}$	particulate matter with a diameter of less than 2.5 micrometres
ppb	parts per billion
ppm	parts per million
RIS	Regulatory Impact Statement
SO_2	sulfur dioxide
UK	United Kingdom
USA	United States of America
USEPA	United States Environmental Protection Agency
WHO	World Health Organization
µg	microgram

Introduction

Background

In 1998, the National Environment Protection (Ambient Air Quality) Measure [AAQ NEPM] was made under the *National Environment Protection Council Act 1994* (*NEPC Act 1994*) setting the ambient air quality monitoring, assessment and reporting framework for six common air pollutants. These pollutants are:

- Carbon monoxide (CO)
- Lead (Pb)
- Particulate matter (or particles) with a diameter of less than 10 micrometres (µm) (known as PM_{10})
- Photochemical oxidants as ozone (O_3)
- Nitrogen dioxide (NO_2)
- Sulfur dioxide (SO_2)

A discussion of proposed changes to the desired environmental outcome (DEO) of the AAQ NEPM is outlined in Section 5. The current DEO is 'ambient air quality that allows for the adequate protection of human health and well-being'.

The AAQ NEPM requires location of monitoring stations in areas that 1) provide an indication of generally representative upper bound (GRUB) air pollution to which the population is exposed, and 2) provide coverage of populated areas in a region. These are in areas that are 'expected to experience relatively high concentrations' but avoid the direct impacts of localised pollutant sources.

In 2003, the AAQ NEPM was varied to include monitoring and reporting protocols and advisory reporting standards for PM with a diameter of less than 2.5 µm (known as $PM_{2.5}$).

In 2015, the AAQ NEPM was again varied to introduce a PM_{10} annual standard, to introduce reporting standards for $PM_{2.5}$ and a future goal for $PM_{2.5}$ (commencing 2025)[1].

The AAQ NEPM requires participating jurisdictions to undertake monitoring, evaluation and reporting activities that allow communities to understand their local air quality and assist the formulation of air quality policies. It provides a focus for air quality issues and drives all jurisdictions to work towards nationally consistent monitoring techniques and reporting. The AAQ NEPM does not compel or direct pollution control measures.

2011 review of the AAQ NEPM

In 2005, the National Environment Protection Council (NEPC), which is comprised of Australia's Environment Ministers, commenced a review of the AAQ NEPM[2]. The review focussed on several topics including the effectiveness of the AAQ NEPM in meeting its desired environmental outcome,

[1] Note that the future goal for $PM_{2.5}$ is not a future standard but a goal that will provide a framework for continuous improvement and facilitate a review of the $PM_{2.5}$ standard.

[2] The review commenced in 2005 and included a 2005 scoping paper, two discussion papers (2007 and 2010), a preliminary cost-benefit analysis and development of emission reduction actions. A series of public consultations associated with the key documents occurred as part of the review http://www.nepc.gov.au/system/files/resources/3405e986-afe9-bdb4-5d2c-383f3ea1e911/files/aaq-review-report-2011.pdf

how effective it is in generating accurate and consistent air pollution information, the simplicity of implementation, and the need for any variation.

The AAQ NEPM review report was released in 2011. The report made 23 recommendations, including to review all ambient air quality standards to align with recent health evidence (Recommendation 4) and to revise the desired environmental outcome of the AAQ NEPM to 'minimise the risk from adverse health impacts from exposure to air pollution for all people wherever they may live'.

2014 review of the particle standards

Following the 2011 review, the then Council of Australian Governments prioritised the review of the particle standards based on the health evidence of impacts from exposure to particles, the levels experienced in Australia, and because the potential range of actions and magnitude of health benefits are greater than for any other pollutant in the AAQ NEPM.

The review of the particle standards commenced in 2012 and was completed in 2014. As per the requirements of the *NEPC Act 1994*, the review included the development of an Impact Statement and draft varied AAQ NEPM which was released for public comment between 31 July to 10 October 2014. Following the completion of the public consultation period and consideration of submissions[3], NEPC varied the AAQ NEPM in December 2015.

2019 review of O_3, NO_2 and SO_2 standards

This review of the O_3, NO_2 and SO_2 standards in the AAQ NEPM commenced in 2015 and follows the 2014 review of the AAQ NEPM particles standards. In particular, it addresses Recommendation 4 from the 2011 AAQ NEPM review to update the standards based on new health evidence. However, it also addresses other recommendations from the review noted in the table below.

Number in NEPM review	Recommendation
1	Revise the desired environmental outcome of the NEPM to 'minimise the risk from adverse health impacts from exposure to air pollution for all people wherever they may live'.
2	Revise the desired environmental goal to make reference to the air quality standards and incorporation of exposure-reduction targets for priority pollutants.
4	Revise the standards for all air pollutants in Schedule 1 of the NEPM to take into account new evidence around the health effects of air pollution.
6	Introduce an 8-hour standard for ozone.
8	Introduce an exposure-reduction framework and targets for priority pollutants.
9	Remove allowable exceedances from Schedule 2 and introduce a natural events rule.
10	Redesign monitoring networks to represent population exposure on a pollutant-by-pollutant basis without compromising data collection for long-

[3] http://www.nepc.gov.au/system/files/pages/18ae5913-2e17-4746-a5d6-ffa972cf4fdb/files/aaq-summary-submissions.pdf

Number in NEPM review	Recommendation
	term trend analysis. A procedure to determine the location and number of sites similar to EU and/or USEPA is recommended.
11	Remove the population threshold and formula to enable monitoring on potential population risk rather than on population size.
12	Amend requirements of monitoring methods (clause 16 and Schedule 3) to allow appropriate Australian Standards methods; or methods determined by the EU and/or USEPA as Reference or Equivalence Methods.
17	Amend the AAQ NEPM protocol (part 4) to incorporate natural event rule including definition of these events and criteria for assessment and reporting.

The NEPC signalled its intent to vary the AAQ NEPM in December 2018. A notice of intent to vary the AAQ NEPM was published on 18 January 2019. Subsequently, a notice of public consultation was published on 23 May 2019 – triggering the commencement of public consultation.

Impact Statement and draft varied AAQ NEPM

As per the requirements of the *NEPC Act 1994*, this review has included the development of an Impact Statement and draft varied AAQ NEPM.

The Impact Statement outlined:

- Air quality management in Australia
- Statement of the problem and the case for government intervention
- Review methodology
- Discussion of the desired environmental outcome and goal of the AAQ NEPM
- Individual impact assessments and recommendations for SO_2, NO_2 and O_3 standards (which includes an assessment of the feasibility of a range of standard options and the costs and benefits of a hypothetical abatement package that could be introduced to lower concentrations)
- Other recommendations (relating to aspects of the AAQ NEPM other than the standards)
- Consultation questions

As per the *NEPC Act 1994*, NEPC must have regard to the Impact Statement and submissions received during public consultation in deciding whether or not to vary the AAQ NEPM.

Public consultation

Public consultation for this review occurred from 23 May to 7 August 2019 (some late submissions were received until 14 August).

The following principal documents were available throughout the public consultation period:

- Impact Statement for the Draft Variation to the National Environment Protection (Ambient Air Quality) Measure for sulfur dioxide, nitrogen dioxide and ozone
- Appendix A: Air Quality Study
- Appendix B: Health Risk Assessment (HRA)
- Appendix C: Cost-benefit Analysis (CBA)

- Draft varied AAQ NEPM

As part of public consultation, information sessions were held across the country. These sessions were determined on the request of jurisdictions.

The purpose of the information sessions was to convey the key information from the Impact Statement and supporting documents, to outline the process for the public to make submissions and to answer questions.

The information sessions included a webinar[4] to give equal opportunity to people who could not attend other sessions.

Information session location	Date
Brisbane	7 June 2019
Sydney	13 June 2019
Melbourne	27 June 2019
Adelaide	3 July 2019
Perth	11 July 2019
Webinar	16 July 2019
Newcastle	23 July 2019

In total, 161 people attended the in-person sessions and 71 people viewed the webinar.

Attendees represented industry (34%), community (19%), government (18%), health and environment groups (9%) and consultancies (18%) and air quality groups / academia (2%).

Submissions

The NEPC Executive Officer received approximately 18,100 submissions including approximately 450 unique submissions. Form submissions received had been coordinated by:

- Australian Conservation Foundation (~2,000)
- Environmental Justice Australia (~10,000)
- Nature Conservation Council (~5,000)
- Anzac Park Public School, Cammeray, NSW (45)

Unique submissions were received from a range of stakeholders including:

- Non-government organisations (NGOs, including Doctors for the Environment Australia, Australian Conservation Foundation, Environmental Justice Australia, Nature Conservation Council, Australian Nursing and Midwifery Federation, The Royal Australasian College of Physicians, Australian Medical Association) (4.5%)
- Community and community groups (90%)
- Industry groups and industry (representing mining, energy, aluminium, petroleum, cement, brick manufacturing) (4.5%)

[4] https://www.youtube.com/watch?v=QqCXKz7IEDY&feature=youtu.be

- Local government and researchers (1%)

Overview of key issues and NEPC response

This section outlines the key issues identified through the public submissions and NEPC's responses.

As required under the *NEPC Act 1994*, NEPC must consider all submissions when developing or varying a NEPM and this has been done in this review. Some issues are beyond the scope of this review and this has been reflected in the responses.

The key issues received through the submissions can be categorised as follows:

- Issue 1 Desired environmental outcome
- Issue 2 Location of AAQ NEPM monitoring stations
- Issue 3 Application of the AAQ NEPM in states and territories
- Issue 4 General comments on standards
- Issue 5 1-hour SO_2 standard and form
- Issue 6 24-hour SO_2 standard
- Issue 7 10-minute SO_2 standard
- Issue 8 1-hour NO_2 standard and form
- Issue 9 Annual NO_2 standard
- Issue 10 8-hour O_3 standard
- Issue 11 Removal of standards
- Issue 12 Exposure reduction framework
- Issue 13 Exceptional events rule and allowable exceedances
- Issue 14 Comments on technical aspects
- Issue 15 Community involvement in standard setting
- Issue 16 Introduction of enforceable standards and national legislation
- Issue 17 Public access to monitoring data and AAQ NEPM reporting
- Issue 18 New tools and research to inform future standards
- Issue 19 Timing for making and implementing the AAQ NEPM
- Issue 20 Frequency of AAQ NEPM reviews
- Issue 21 Protection of the environment
- Issue 22 Specific emissions sources
- Issue 23 Other pollutants

The remainder of this document provides a summary of views from the submissions and NEPC's response for each issue.

A list of NEPC's positions following public consultation are provided in Attachment 1.

Issue 1 Desired environmental outcome

Impact Statement position

The Impact Statement proposes updating the desired environmental outcome (DEO) in the AAQ NEPM from "*ambient air quality that allows for the adequate protection of human health and well-being*" to "*ambient air quality that minimises the risk of adverse health impacts from exposure to air pollution for all people, wherever they live in Australia*".

Submissions

Many submissions showed support for the DEO as proposed.

> *"The objective of the NEPM is appropriate, and we support the change in wording from 'adequate protection' to 'minimising the risk' and making clear that this applies to people wherever they live in Australia" (#1 Doctors for the Environment Australia)*

> *"The [Australian Environment and Planning Law Group] AEPLG supports goals to improve national consistency in environment protection outcomes and a national framework for monitoring and reporting on ambient air pollutant exposure. It supports the proposed variation to the desired health and well-being environmental outcome as set out clause 5 of the Proposed NEPM" (#19 Law Council of Australia)*

> *"We support the proposed amendments to the desired environmental outcome (s5) to provide that it 'minimise the risk of adverse health impacts from exposure to air pollution for all people, wherever they may live'. This will assist in providing more clarity in the purpose of the NEPM and acknowledgment of environmental injustice that can be prevalent in the regulation of air emissions. (#33 Environmental Defenders Office of Australia)*

> *"Health experts are universally critical of the practice of managing 'up to' the national standards. Mere compliance with the standards is insufficient from a health standpoint. As recommended in the 2011 NEPM review, the objective should be "minimise the risk from adverse health impacts from exposure to air pollution for all people wherever they may live". This would mean adopting standards that minimise the air pollution health burden in pollution hot spots like the City of Maribyrnong" (#6 Maribyrnong Truck Action Group)*

> *"PHAA strongly supports the revised desired environmental outcome. Policy makers must promote clean ambient air, and ensure regulatory and monitoring mechanisms exist to mitigate impacts on population health. "Wherever they may live" includes across states, across regions, and within cities, and must include protection for people living close to busy roads. (#27 Public Health Association of Australia)*

Others agreed with the proposed DEO with some additional inclusions to ensure broader coverage where the NEPM applies.

> *"[The proposed DEO] is an important advance. However, we propose that the definition be broadened to also include protection of people in other locations where they spend significant parts of the day e.g. school[s], child care centres, nursing homes, etc. It should be noted that these locations cater for sub-populations who are potentially vulnerable to the effects of air pollution." (#5 Centre for Air Pollution, Energy and Health Research)*

> *The proposed change to focus on risk minimisation is supported. The change from a broader coverage of the AAQ NEPM (human health and well-being) to a narrower focus of where people 'live' needs to be reconsidered. The City of Sydney's opinion is that the AAQ NEPM should address risks in all places where people may be present and not just where people may live, including any locations where exposure to 'the population at risk' may be equal to the relevant exposure period(s) for the air pollutants. (#50 City of Sydney)*

Some suggested wording to clarify that the AAQ NEPM focus be on regions as a whole.

'It is recommended that the proposed text in Part 2 Section 5 be altered from: "minimises the risk of adverse health impacts from exposure to air pollution for all people, wherever they live in Australia" [to] "minimises the risk of adverse health impacts from exposure to air pollution for people in all regions throughout Australia". In its current form, the text could cause unreasonable and unanticipated practical and financial impositions on government and industry where potentially sensitive individuals or activities are located close to pollutant sources. It is suggested that a note be associated with Table 1 indicating that the standards apply to regions as a whole and are not expected to be used as exposure limits for licensing conditions.' (#385 Confidential)

Others objected to the proposed change on the understanding that it would then apply to hotspots (which is not the original intent of the AAQ NEPM[5]) or because it would potentially contradict other air quality management approaches adopted by jurisdictions:

"[The new] approach implies that the same ambient air quality should be achieved at all locations, including hot spots. This is despite the current desired environmental outcome purposely excluding such sources of pollution given these are not representative of general population exposure…it is not feasible to achieve the same air quality standards "for all people wherever they live". QRC is of the view that the current AAQ NEPM desired environmental outcome remains appropriate in representing the majority of the population while accommodating site-specific variations and recommends that it should be retained as is." (#13 Queensland Resources Council)

"This proposed shift to "all people, wherever they live" has significant implications for the geographic location of cost impacts of the draft variation and it is noteworthy that the supporting analysis is based on monitoring stations which are not representative of those areas and do not match the location of likely cost impacts." (#24 Australian Aluminium Council)

"NSWMC believes the proposed wording could be perceived to be contradictory to the general approach by environmental and health agencies that aims to deliver the greatest health benefits by minimising overall population exposure to air pollution. For example, the NSW Government is developing a 'Clean Air Metric', which weights air pollution by population and "helps track whether air quality management is delivering the greatest positive health outcomes for the people of NSW". NEPC should be aware of the potential for a perceived contradiction between the proposed wording of the desired environmental outcome and the approach that is taken in practice by health and environmental agencies." (#22 NSW Minerals Council)

'The Impact Statement provides 'the AAQ NEPM standards were established in relation to broad air quality within airsheds, and are applicable at urban locations away from hot spots. The original intent of the AAQ NEPM was to avoid monitoring near localised point sources of pollution and at peak sites, as these would not represent general population exposure (NEPC 2011a)'… The proposed variation of the desired environmental outcome to achieve '…ambient air quality that minimises the risk of adverse health impacts from exposure to air

[5] An example is on page 8 of the Queensland Resource Council submission.

pollution for all people wherever they live in Australia' may in implementation represent a significant divergence from this intent.' (#43 Minerals Council of Australia)

Response

NEPC notes stakeholder perceptions that the proposed desired environmental outcome would automatically include hotspot monitoring under the AAQ NEPM framework.

NEPC confirms that the intent of the AAQ NEPM is to monitor at sites that provide a representative measure of the air quality likely to be experienced by the general population in a region or sub-region, and that air quality monitoring of specific significant pollution sources (such as individual industry premises) should continue to be monitored and assessed through state-based air quality management frameworks.

Consequently, **NEPC proposes an update to the desired environmental outcome** to better align it with the intent of the AAQ NEPM:

> ***"The desired environmental outcome of this Measure is ambient air quality that minimises the risk of adverse health impacts from exposure to air pollution"***

This update maintains the core of the Impact Statement proposal, which was widely supported by submissions – that is, to change the outcome from providing *adequate protection* to *minimising risk* (consistent with the latest health evidence).

NEPC considers that the updated proposal:

- Avoids misunderstanding of how and where the AAQ NEPM should apply, i.e. that the AAQ NEPM is not an instrument for hotspot monitoring as construed by the majority of submitters (including community, environment and health groups, and industry)
- Better aligns with the general requirements for AAQ NEPM monitoring, i.e. to monitor at sites that provide a general representation of the upper bound of exposure to pollution (but that are not located at peak-level sites) and to determine region (or sub-region) scale population-based averages

Issue 2 discusses the location and number of monitoring stations and the AAQ NEPM's function as a hotspot monitoring framework. Jurisdictions currently can establish monitoring stations in areas with a population fewer than 25,000 people and this will continue.

Issue 2 Location and number of monitoring stations

Impact Statement position

The Impact Statement proposes a change to clause 14 of the AAQ NEPM (Number of monitoring stations). The proposal is to update clause 14 so jurisdictions use an assessment of the potential 'population at risk' as a main determinant for the number of monitoring stations established in a jurisdiction. Definitions to support the application of the clause are also proposed. This proposal is consistent with a recommendation made in the 2011 NEPM Review.

Under this approach, jurisdictions should assess if an area is high risk, i.e. based on the prevalence of sensitive land uses (such as residential premises, childcare facilities) in the area, the occurrence of adverse health effects from exposure to air pollution or where there is relative disadvantage in the

community. To achieve this, jurisdictions would develop guidance to form a consistent approach to determine risk.

This change gives a lower priority to the 25,000 population threshold, which is proposed to be retained given that population thresholds do not inhibit risk-based monitoring and that the 25,000 population threshold is best practice in terms of what is adopted elsewhere in the world (for example, compared to a minimum of 100,000 in other leading countries).

It is important to note that the AAQ NEPM currently does not prevent jurisdictions from having more AAQ NEPM monitoring stations in areas where populations fall below the 25,000 threshold – and this would not change with the NEPC proposal.

The Impact Statement does not propose any changes to clause 13 of the AAQ NEPM, related to the location and placement of monitoring stations.

Submissions

The submissions received show that stakeholders hold a range of views about how jurisdictions determine the number and placement of monitoring stations. Central to these views is whether the AAQ NEPM should be used for 'hotspot' monitoring.

Some submissions proposed that the AAQ NEPM be modified to enable 'hotspot' monitoring or monitoring in areas with less than 25,000 people.

> *'Suggest that populations adjacent to high traffic density areas and truck transport routes be specifically included.' (#3 Clean Air Society of Australia and New Zealand)*
>
> *'The network of NEPM compliance monitors should be expanded to reflect particular risks from widespread source emissions, including the Upper Hunter Valley.' (#4 Environmental Justice Australia)*
>
> *'[We] advocate for some monitoring to be conducted in hotspot locations, especially where there are also facilities for sensitive populations such as schools. With population growth in Australia's major cities occurring in infill locations we are concerned over the drastic increase in medium-high rise housing being built along busy roads. Over the next two decades, this will have the net effect of increasing population exposure to elevated levels of air pollution… Without hotspot monitoring to validate modelled data, it will be difficult to drive relevant exposure reduction programs…' (#5 Centre for Air Pollution, Energy and Health Research)*
>
> *'Remove the 25,000 population threshold so that communities at greatest risk of harm are protected by the ambient air standards for criteria pollutants.' (#53 Greenpeace)*
>
> *'…we recommend that the network of compliance monitors should be expanded to cover risks from coal-fired power plants and major roadways.' (#39 Nature Conservation Council of NSW)*

One submission indicated concern with the implications that changes to clause 14 have on other AAQ NEPM-monitored pollutants, such as PM, and indicated that the proposal would have significant unintended consequences on their business.

'The inclusion of the definition of "population at risk" and "sensitive land uses" will now also apply to particulate matter, and therefore has potential to impact how particulate matter is monitored.' (#15 Port Hedland Industries Council)

Some submissions indicated their view that the proposal is subjective and open to interpretation and suggested that NEPC provide clear guidance on how risk will be determined.

'The very broad definitions within the NEPM AAQ, are unclear, subjective and leave it open to considerable interpretation. [Roy Hill recommend that] The original criteria, [be] based on population only, [and] be applied and the definitions of "high risk areas" and "sensitive land uses" be removed. Roy Hill strongly support community partnerships and investment into the community however believe that current definitions could hinder industry investment in communities, and require additional monitoring in areas utilised by only very small population sizes.' (#14 Roy Hill)

'It is unclear how each jurisdiction will determine the health and level of risk of a population. QRC recommends that the NEPC provide guidance to the State and Territory Governments with respect to key considerations or an approach for determining a population at risk to encourage consistency in application.' (#13 Queensland Resources Council)

'In addition, the Impact Statement proposes changing the guidance on the location of performance monitoring stations from a population threshold of 25,000, to locating monitoring stations in areas determined to be high risk… T*his change will require jurisdictions to identify a potential 'population at risk'… there is a possibility that jurisdictions will make wholesale determinations that all populations with residential premises located near point source boundaries or in industry intensive airsheds are 'at risk' and impose mandatory monitoring requirements that are contrary to the original intent of the AAQ NEPM… The MCA considers that providing specific guidance within the AAQ NEPM on the appropriate method of determining a 'population at risk' under the proposed new definitions would help to mitigate inappropriate application of s (14) 'number of performance monitoring stations'' (#43 Minerals Council of Australia)*

'We support the removal of the figure of 25,000 as the base number for requiring monitoring of air quality in section 14. This is being replaced with a requirement that the 'number of performance monitoring stations must be based on determining the potential population at risk.' We strongly recommend that guidance is provided to help determine when a population would be said to be 'at risk' to help clarify the right of communities to have local air quality monitored and to avoid uncertainty.' (#33 Environmental Defender's Office of Australia)

Some submissions indicated that that some stakeholders misinterpret the 25,000 population threshold to be an exemption – where AAQ NEPM monitoring stations are not to be located in areas with populations below 25,000 people.

'Currently air pollution only needs to be monitored for population centres with more than 25,000 people.' (#2 Australian Nursery and Midwifery Federation, Victorian Branch)

'Communities who live in rural areas are frequently not provided with the same level of regulatory protection from harmful air pollutants. Nor are there requirements to monitor and report air emissions that these smaller rural communities are exposed to because historically

the population has not been considered large enough.' (#33 Environmental Defenders Office of Australia)

'…the new inclusion of "population at risk" and "sensitive land uses" including "high risk areas" (clause 14(1) and 14(2)) could now be interpreted to require additional monitoring in areas that do not meet the 25,000 people threshold...' (#15 Port Hedland Industries Council)

'Monitoring and reporting obligations are currently based on population size, with exemptions for population centres with less than 25,000 people. This approach clearly constitutes an example of environmental injustice.' (#51 Bioenergy Australia)

'Under the current approach, small communities (under 25,000 people) are exempt from monitoring and reporting obligations. It is crucial that the Australian population in its entirety is protected from health damaging air pollution, this should include small communities.' (#39 Nature Conservation Council of NSW)

'The Network objects to the 2001 NSW Monitoring Plan that divides the Upper Hunter into two separate regions for the purpose of monitoring Ambient Air Quality under the NEPM goals. This excludes the Upper Hunter from the National Environment Protocol…We urge the National Environment Protection Council to revisit this decision, particularly in regard to monitoring SO_2, NO_2 and ambient air quality in the Upper Hunter as a single region. It is imperative that the Upper Hunter Region be included in the National Environment Protocol. (#12 Hunter Communities Network)

One submission expressed concern that the proposed definition of 'population at risk' would be difficult to apply and beyond the means of jurisdictions.

'… we feel that the current definition of "population at risk" appears to rely on real detection of increased health outcomes in specific populations. However, it is important to note that detecting or estimating the "rate of adverse health effects" in very small populations, eg school populations, is difficult to achieve with sufficient accuracy, because of the small sample sizes. For instance, detecting mortality and cancer cases is very difficult in small populations. Likewise detecting more common health effects can be difficult in small populations unless specific health studies are conducted. These are usually beyond the means of participating jurisdictions. However, there is substantial scientific evidence of harmful effects from which we can estimate likely adverse outcomes. We advocate for a different definition of "population at risk" to be used.' (#5 Centre for Air Pollution, Energy and Health Research)

Submissions also made suggestions related to clause 13 (Location of monitoring stations), in particular to add a clause to enable monitoring near major roads.

'Part 4 (13) Location of performance monitoring stations have a new paragraph: "In addition to background monitoring sites each jurisdiction must establish some roadside monitoring sites on roads with more than 20,000 vehicles per day, at locations where people live or work."' (#1 Doctors for the Environment Australia)

Response

NEPC notes the wide range of views associated with the proposed changes to how the number (and location) of monitoring stations is determined in the AAQ NEPM. NEPC wishes to emphasise that the changes proposed are not intended to fundamentally change the AAQ NEPM's monitoring framework requirements to require 'hotspot' monitoring, but to provide for more flexible, risk-based monitoring which will better consider vulnerable populations that are at risk of being harmed by air pollution.

The AAQ NEPM network is expected to be a subset of a jurisdiction's overall monitoring network. In general, the AAQ NEPM is not intended for 'hotspot' or peak site monitoring to measure pollution levels from emission sources. Rather, the AAQ NEPM should provide a representative measure of the air quality likely to be experienced by the general population in the region or sub-region.

The AAQ NEPM requires location of monitoring stations in areas that 1) provide an indication of generally representative upper bound (GRUB) air pollution to which the population is exposed, and 2) provide coverage of populated areas in a region. These are in areas that are 'expected to experience relatively high concentrations' but avoid the direct impacts of localised pollutant sources.

NEPC's proposed changes to clause 14 would still rely on the use of GRUB stations to measure air quality in areas that have elevated concentrations from industry but that do not capture direct impacts of localised pollutant sources.

The purpose of the changes is to prioritise consideration of risk (based on the vulnerability of the population to air pollution) – rather than on population size only – to determine where monitoring stations should be placed.

Upon consideration of submissions, **NEPC proposes to update the definition of '*population at risk*' to incorporate consideration of *potential* risk rather than be solely based on actual adverse health outcomes**, which as the Centre for Air Pollution, Energy and Health Research notes, may be difficult in some circumstances, e.g. where sample sizes are small:

> ***population at risk*** means the population of a region or sub-region that is at risk of being harmed by air pollution, as determined by the relevant participating jurisdiction based on:
>
> a) the number of *or potential for* adverse health effects from exposure to air pollution (for example fatalities, cancers or illnesses) in the population of a region or sub-region over a specified period of time; or
> b) the rate of adverse health effects from exposure to air pollution for a given location or sub-population within the region or sub-region.

NEPC also proposes to retain the 25,000 person population formula (as a lower order consideration) given that:

- A review of the AAQ NEPM monitoring network led by an intergovernmental Expert Working Group showed that the 25,000 person population threshold is lower than anywhere else in the world
- The 25,000 person population formula does not preclude consideration of risk principles in determining the number and placement of monitoring stations within a region

Importantly, jurisdictions have always been able to place greater or fewer monitoring stations than that determined through the population threshold (i.e. the ability to place monitoring stations in

areas where there are fewer than 25,000 people) but the proposed changes elevate consideration of risk and brings consistency between jurisdictions.

NEPC notes stakeholder views on the importance of guidance to inform the method jurisdictions will apply to determine risk and for consistency in its application. **NEPC proposes that some form of guidance, for example, in the form of a technical paper, be developed for clarity and certainty**. A technical inter-jurisdictional group, such as the newly established National Air Quality Technical Advisory Group (NATAG), could develop such guidance, through the National Clean Air Agreement process.

Notably, these proposed changes could impact the way other pollutants (not considered in this review, such as particles) are measured under the AAQ NEPM framework. NEPC notes that consideration of monitoring locations under the AAQ NEPM was foreshadowed in the Summary of Submissions and NEPC Response document prepared as part of the review of the AAQ NEPM particles standards[6].

NEPC notes the suggestion to update clause 13 of the AAQ NEPM to specifically allow for roadside monitoring (along roads with more than 20,000 vehicles a day) to occur under the AAQ NEPM. The AAQ NEPM requires that, to the extent practicable, monitoring stations be placed in accordance with AS/NZS 3580.1.1:2016, which stipulates where the monitoring station should be positioned and recommends minimum separation distances from sources such as roads[7].

The AAQ NEPM monitoring network should provide data indicative of the air quality experienced by most of the population as well as in populated areas which are expected to experience relatively high concentrations.

While NEPC agrees that a nationally consistent program of monitoring near roads would be beneficial to build a policy evidence base for road development assessment, NEPC considers that the AAQ NEPM is not the appropriate tool to achieve this. Rather, NEPC proposes that this be considered by NATAG. This is discussed further in Issue 18.

Issue 3 Application of the AAQ NEPM in states and territories

Impact Statement position

The Impact Statement outlines the various ways in which the NEPM standards are applied in the states and territories, including as criteria for air quality assessments applied to the boundary for specific point source projects, and acknowledges that some uses are outside the context prescribed by the AAQ NEPM.

Purpose of the AAQ NEPM

The AAQ NEPM provides a nationally consistent framework for the monitoring and reporting of ambient air quality against air quality standards and goals.

[6] http://www.nepc.gov.au/system/files/pages/18ae5913-2e17-4746-a5d6-ffa972cf4fdb/files/aaq-summary-submissions.pdf

[7] The Australian/New Zealand Standard (AS/NSZ) 3580.1.1:2016 does not prohibit the placement of monitoring stations near roads but provides recommended separation distances between neighbourhood and background stations, and roads based on estimated vehicle numbers per day.

The standards and goals of the NEPM aim to guide policy formulation to minimise risks to people. Under the current AAQ NEPM, participating jurisdictions are required to undertake monitoring and publicly report air pollution levels and generate data that assists in formulating air quality policies.

AAQ NEPM standards are derived for application within the context of the AAQ NEPM (and protocols), at locations that are representative of a region's air quality. Under this general exposure approach the standards and goals are applicable to urban sites away from specific sources of pollution, such as busy roads and industrial smokestacks. The original intent of the AAQ NEPM was to avoid monitoring near localised point sources of pollution and at peak sites, as these would not represent general population exposure. While the changes to clause 14 to focus the AAQ NEPM on high risk areas and vulnerable populations that are at risk of being harmed by air pollution could lead to more monitoring in areas closer to industry, the intention of the NEPM remains to provide monitoring in locations representative of a population's air quality.

The AAQ NEPM in itself does not prescribe sanctions for non-compliance with the air quality standards and the AAQ NEPM does not compel or direct air pollution control measures.

In relation to the use of the AAQ NEPM by jurisdictions, states and territories are responsible for managing air quality and air emissions in relation to certain types of sources (e.g. industrial facilities including landfills, quarries, power stations, coal mines, etc.). To fulfil these responsibilities, jurisdictions have policies, legislation or guidance which includes facility design goals, assessment criteria, licence conditions or other ways to protect local communities from the impacts of air pollution from industrial facilities.

Where this is the case, in practice AAQ NEPM standards are often used by jurisdictions as criteria for air quality assessments. In this sense, the AAQ NEPM standards are used by jurisdictions for policy and regulatory purposes outside the context prescribed by the AAQ NEPM. AAQ NEPM standards are also sometimes applied by jurisdictions at other locations as part of environmental assessment, for example, at the boundary of an industrial facility.

Submissions

Submissions show industry stakeholders are concerned that AAQ NEPM standards are applied in jurisdictions as point source limits, which is not the purpose for which they have been developed. Where this occurs, any changes to the AAQ NEPM standards may flow through to changes in point source limits imposed through licence conditions.

> *"Interpreting the AAQ NEPM in a manner that goes beyond the intended regional focus of the framework, in favour of point source monitoring for example, has the potential to create an excessive regulatory and cost burden for industry and is not supported." (#31 Cement Industry Federation)*

> *"Industrial sites, especially those with environmental licences, have the AAQ standards enforced well beyond the requirements of the NEPM. Commonly the ambient standards are applied as impact assessment criteria by the jurisdictions on industrial sites." (#32 Australian Sustainable Business Group)*

> *"Applying the AAQ NEPM standards as if they are impact targets, as is currently practiced generally is not in line the AAQ NEPM requirements for ambient air quality…many industrial sites are measured according to their ground level (not average ambient) concentrations at their nearest receptor…" (#32 Australian Sustainable Business Group)*

'…state jurisdictions in Australia usually adopt AAQ NEPM standards as impact assessment standards for individual facilities during the development approval process as well as applying them at hot spots near major point sources or at the boundary of an industrial facility. The application of the AAQ NEPM in this manner is inconsistent with how the AAQ NEPM standards should be applied…but nonetheless it is current practice. If this practice were to continue with the proposed new standards then a number of areas within close proximity to large industrial sources could exceed these standards, potentially triggering a cost prohibitive abatement program.' (#28 Australian Energy Council)

'Origin's key concern with the proposed AAQ NEPM standards is the inappropriate application of the AAQ NEPM by state and territory regulators:

- *To localised point sources or peak sites as compliance assessment criteria; or*
- *During the approvals process for new or upgraded facilities as formal or informal design assessment criteria.' (#35 Origin)*

'In general, I support the lowering of the standards as proposed. However, I believe it critical that the NEPM better clarify the intent and basis of the standards and goals so that they are not just adopted by state and local regulatory agencies as absolute limits without practical strategies and mechanisms to reach them.' (#347 Ask Consulting)

Some submissions called for NEPC to review how the AAQ NEPM values are applied or for some guidance for jurisdictions outlining how the AAQ NEPM standards should or should not be applied.

'Once set in legislation, some jurisdictions have been observed to inappropriately impose regulatory objectives that are numerically the same as, or similar to, the standards contained in the AAQ NEPM. These have then been applied as routine indicators for project conditioning and compliance of discrete activities at point sources...this practice does not recognise the difference between ambient and point source measurements and management…QRC recommends that implementation guidance should accompany the release of any revised AAQ NEPM standards to assist with interpretation across jurisdictions. The NEPC should also request, and support the jurisdictions in developing, similar guidance at a State and Territory level to avoid the inappropriate, automatic translation of the AAQ NEPMs into legislation and/or project conditioning.' (#13 Queensland Resources Council)

'While the intent of the AAQ NEPM is to develop national standards and a nationally consistent framework for the monitoring and reporting of seven common ambient pollutants, the use of the standards is not applied consistently by separate jurisdictions within Australia…Some jurisdictions use the AAQ NEPM standards as the criteria for air quality assessments and industrial control, while others do not. This does not meet the intent of the NEPM… [Alcoa recommends to] Review application of AAQ NEPM across all jurisdiction to ensure it is consistent.' (#23 Alcoa of Australia)

'NEPC should also reinforce the purpose of the NEPM standards and how they are intended to be implemented – i.e. they are not intended to be used as strict impact assessment criterion or pollution limits for industrial premises.' (#22 NSW Minerals Council)

Response

NEPC notes stakeholder concerns regarding how jurisdictions apply the AAQ NEPM standards in contexts other than those for which they have been developed, e.g. as point source target levels.

The AAQ NEPM requires jurisdictions to undertake monitoring, publicly report compliance against AAQ NEPM standards and generate data to assist jurisdictions to formulate air quality policies.

It is not the intent of the AAQ NEPM to prescribe the way jurisdictions assess or manage point source emissions. Rather, the intent of the AAQ NEPM is to assess general population exposure.

Decisions regarding how the AAQ NEPM is implemented in each jurisdiction are made by individual jurisdictions. Jurisdictions must make their own regulatory assessment in determining if and how they use AAQ NEPM standards in a regulatory context, e.g. as assessment criteria.

Jurisdictions should continue to manage emissions and air quality in their jurisdiction through their own legislation, policies and guidance. Different approaches are adopted by jurisdictions to manage their specific air environments, and it is the responsibility of jurisdictions to adequately justify and communicate their management approaches.

The need for guidance to help jurisdictions apply the AAQ NEPM standards was also raised in the review of the particle standards in the AAQ NEPM[8]. To address this, NEPC provided guidance for jurisdictions in the AAQ NEPM explanatory statement[9], noting that it was not intended the guidance impede or restrict jurisdictional management of their air environment.

Consistent with the approach taken in the review of the particle standards, **NEPC proposes that the explanatory statement for this review clarify the intent of the AAQ NEPM and how it should be used by jurisdictions**:

> *The standards in the AAQ NEPM are not intended to be applied as an environmental standard by jurisdictional environmental regulators without consideration of regulatory impacts. Section 7 of the NEPC Acts allow jurisdictions to implement the AAQ NEPM by such laws and other arrangements as are necessary. Jurisdictions are not precluded from adopting more stringent or complementary standards or goals for their own policy or regulatory purposes. In doing this, jurisdictions may utilise a risk-based approach in determining environmental standards appropriate for their own circumstances or conditions, along with improvement strategies for regulated and non-regulated sources and exposure reduction strategies. Standard regulatory processes, including public consultation and consideration of costs and benefits, are undertaken prior to the adoption of any government regulation to improve air quality at the jurisdiction or national level.*

Issue 4 General comments on standards and standard setting

Impact Statement position

The Impact Statement describes the weight-of-evidence approach adopted in making recommendations on the standards, that is, consistent with the requirements of the *NEPC Act 1994*, what is specified in NEPC's Methodology for Setting Air Quality Standards in Australia (2011) and

[8] http://www.nepc.gov.au/nepms/ambient-air-quality/proposed-variation/consultation
[9] https://www.legislation.gov.au/Details/F2016L00084/Explanatory%20Statement/Text

good practice standard setting approaches used internationally. It included consideration of health protection, WHO guidance, standards in leading jurisdictions (e.g. USA, Canada, EU, UK), the capacity of Australian jurisdictions to meet standards, the scale of the health impacts, and economic considerations such as the effectiveness and efficiency of abatement options.

A review of health literature was conducted as part of the development of the Impact Statement and the supporting Health Risk Assessment (HRA). A key objective of the review was to identify any Australian and international work that had been undertaken since the 2011 AAQ NEPM review report was released that would provide any new evidence to inform the review of the standards for SO_2, NO_2 and O_3.

The Impact Statement acknowledges the mounting evidence that there are health effects associated with exposure to air pollution levels below the current AAQ NEPM standards and shows they lag behind standards adopted in other leading countries or organisations (such as the WHO or EU).

Submissions

Submissions expressed a range of general views on how the standards should be set, on the Impact Statement's approach to forming its recommendations and other general suggestions.

General suggestions for standards

Many submissions expressed support for tightening the AAQ NEPM standards to protect health (including to align with international best practice for air quality).

> *'Reflecting international best practice, stricter health-based standards should be introduced, to reduce the risk of adverse health impacts from exposure to air pollution level.' (#51 Bioenergy Australia)*

> *'Improving Australia's national air pollution standards is crucial to ensure that levels of pollutants like sulfur dioxide, nitrogen dioxide and ozone meet the world best-practice standards. Current standards under the National Environmental Protection Measures (NEPM) are inconsistent with scientific research on the health impacts of air pollution and current international guidelines.' (#39 Nature Conservation Council of NSW)*

> *'The Colong Foundation requests that the Australian Government takes the steps necessary to ensure that state and territory governments adopt international best practice for air quality standards.' (#24 Colong Foundation for the Wilderness)*

> *'It is unacceptable that Australia's standard is so low. Our standard should be brought into line with those set by WHO. Many countries such as the United States, the European Union and China have stricter standards; we believe our communities and all Australians deserve to have the highest standards in the world.' (#41 Anti-Toxic Waste Alliance)*

> *'Sulphur dioxide, nitrogen dioxide and ozone are all respiratory irritants which can exacerbate existing lung disease (such as asthma) but additionally may affect children's lung/cognitive development. Health effects may occur at lower concentrations than previously thought. I would like to see Australia adopting the World Health Organisation's standards. Currently Australia's Sulphur dioxide standard is 10x higher than the recommended WHO standard.' (#75 Kate Poulsen)*

'We need to strengthen our air pollution standards to at least match those advised by the World health organisation.' (#100 Kathy Donnelly)

Australian health studies

An Expert Position Statement, developed with input from a range of stakeholders, expressed that Australian health studies demonstrate health effects below the current and proposed standards.

'Even at low concentrations, nitrogen dioxide, sulfur dioxide and ozone are impacting the health of Australians……. studies have been conducted in Australia and published in the last decade, demonstrating statistically significant health impacts at pollutant concentrations below NEPM thresholds.'

'Traffic related nitrogen dioxide is strongly associated with childhood asthma with effect sizes much greater than previous studies. Increased susceptibilities have been noted in sub-groups such as younger children (between 0 - 4 years) and carriers of specific genetic variants. Nitrogen dioxide is also associated with increased risk of atopy and, consistent with international evidence, reduced lung function, which can lead to lifelong adverse health effects and premature death.'

'Adverse neonatal outcomes, including preterm birth, low weight at birth and foetal growth restriction are associated with maternal exposures to nitrogen dioxide, sulfur dioxide, and ozone. Laboratory confirmed paediatric influenza has also been associated with ozone.'

'Adverse health effects from nitrogen dioxide, sulfur dioxide and ozone are not limited to paediatric and neonatal outcomes. A longitudinal cohort of middle-aged Australians demonstrated positive associations between traffic-related nitrogen dioxide exposure and both current asthma, the incidence of new asthma, and atopy.'

'Long term exposure to sulfur dioxide has been associated with cardiorespiratory mortality. The association persisted at low concentrations and was found to vary across the geographic area of Brisbane.'

'An expert position statement released on 6 August cites a list of recent studies. The statement… was organised by health and pollution experts from a range of organisations including the Lung Health Research Centre, Doctors for the Environment Australia, Royal Australasian College of Physicians, Lung Foundation of Australia, Climate and Health Alliance, Melbourne Energy Institute, Environmental Justice Australia, Clean Air and Urban Landscapes Hub, Melbourne Sustainable Society Institute, Royal Melbourne Hospital and the Peter MacCallum Cancer Centre. These experts also provide a joint recommendation on proposed standards. ACF encourages consideration of the recent reports that are outlined in the statement, their findings, and the standards proposed by these health experts.' (#26 Australian Conservation Foundation).

Consideration of health in setting standards

Some submissions expressed concern that the Impact Statement's recommendations were too heavily influenced by industry cost burden and achievability rather than health protection while others questioned the use of cost-benefit analysis as part of the standard setting process overall.

'If the purpose of the NEPM is to "minimise the risk from adverse health impacts from exposure to air pollution for all people wherever they may live," then alleviating the health burden must take priority in any cost-benefit analysis.' (#6 Maribyrnong Truck Action Group)

'Benefit-cost analysis in setting air pollution standards is flawed…… and inappropriate. In the absence of a reliable benefit-cost analysis methodology, the RIS must be focused on the benefits to health of reducing pollution levels, not the costs associated with doing so.' (#27 Public Health Association Australia)

'[CASANZ notes]… the qualifications placed on the cost benefit analysis of the package of abatement measures modelled. These qualifications raise the question of the value of the cost benefit analysis in decision making on the variation to the standards.' (#3 Clean Air Society of Australia and New Zealand)

'The cost-benefit analysis depends entirely on the interventions that are selected, and the costs involved in implementing them. These are not fixed and future interventions and cost-saving strategies for achieving mitigation cannot be foreshadowed. Setting targets or thresholds based on current technology and costs offers no incentive to drive down pollutant concentrations.' (#5 Centre for Air Pollution, Energy and Health Research)

'We advocate the health-based standards should be set solely on health-based criteria. The question of implementation and regulation is a separate issue. Jurisdictions need to decide on a framework for implementation which takes account of the costs and likely benefits of achieving these standards.' (#5 Centre for Air Pollution, Energy and Health Research)

'The emphasis in this variation process should not be to favour industry and government. Our NEPC has a duty of care to fully consider the environmental, economic and social impacts, especially to those communities that live or work closest to point sources of known pollution. Air pollution needs to be stopped at the source and any proposed changes to our AQ NEPMs need to make this happen... Long term health cost savings (for individuals and our Health system) appear to have been over-ruled in favour of a case for reducing costs for industry and the government. That should not be the basis for this review.' (#328 CleanAirTas)

Some submissions urged that the precautionary principle be better considered in setting the AAQ NEPM standards and expressed the view that it had been given too little emphasis in the recommendations made.

'The Regulatory Impact Statement proposing the new standards suggests that the decision should also be made based on what is easily achievable and what might be cost-effective. Air quality standards should be made on health grounds and where necessary, the precautionary principle should be applied.' (#123 Richard Yin)

'The RIS review process pays lip service to the precautionary principle, that where uncertainty exists it is better to protect health than to allow health damage while waiting for further research. It has however failed to apply the precautionary principle to emerging harms from air pollution with the effects on cognitive development being a prime example.' (#1 Doctors for the Environment Australia)

Response

NEPC notes the range of views concerning the recommended standards and stakeholder's suggestions for what should be considered in NEPC's final decision.

The protection of health from exposure to the three pollutants is a key criterion for standard setting. However, under the *NEPC Act 1994*, the making or varying of NEPMs also requires consideration of environmental, social and economic impacts. The final standard must be set at a level that encompasses the best overall outcome. This approach contrasts to the approach adopted by WHO in setting air quality guidelines, which are set solely upon consideration of health.

The Impact Statement formed its recommendations based on a weight-of-evidence approach, which was developed to be consistent with the *NEPC Act 1994* and in line with best practice standard setting approaches adopted elsewhere.

NEPC acknowledges the health evidence showing that there are health effects from exposures below the current standards that include impacts on the respiratory and cardiovascular systems including asthma, chronic obstructive pulmonary disease, and premature death. NEPC also notes that these health studies add to the weight of evidence that there are health effects at the generally low levels experienced in Australia.

NEPC considers that there is sufficient health evidence to support a variation to the standards now, taking into account this evidence, international standards and WHO guidelines.

NEPC notes the health studies identified through the public consultation process. These have been considered and addressed in subsequent sections of this document (in particular, under Issue 14); however, NEPC wishes to emphasise that good practice HRA relies on the selection of studies with enough statistical power to quantify the increased risk of a health outcome at a given concentration within a reasonable margin of error. For this reason, in setting standards, regulators tend to use systematic reviews and results from meta-analyses that combine the findings from a number of large, robust, independent, peer reviewed studies. These better account for heterogeneity by providing information across a larger geographical area. They can also provide more precise exposure response estimates.

NEPC notes that there is some uncertainty regarding particular adverse health effects from long term exposure to low concentrations of O_3, NO_2 and SO_2. In this analysis, the precautionary principle is considered alongside environmental, social and economic impacts, which are required to be considered by the *NEPC Act 1994*. The precautionary principle is incorporated in the Impact Statement assessment using sensitivity analyses to estimate alternative health impacts in the case that the published relative risks of exposure underpredict the real health effects. The results of the sensitivity analyses were considered as part of the weight-of-evidence approach used to develop recommendations.

Issue 5 1-hour SO_2 standard and form

Impact Statement position

The current 1-hour SO_2 standard is 200 ppb with 1 day per year allowable exceedance.

Based on the weight-of-evidence, the Impact Statement proposes:

- The 1-hour SO_2 standard should be retained and have a numerical value of 100 ppb

- A future 1-hour SO_2 standard of 75 ppb for implementation from 2025
- The form of the standard should be the maximum value with no allowable exceedances

Submissions

Some submissions, such as #137 Beeliar Group, supported the Impact Statement's recommendations to retain a 1-hour SO_2 standard and reduce the numerical value to 100 ppb with no allowable exceedances followed by a further reduction to 75 ppb in 2025.

The majority of submissions (including form submissions) favoured the use of a 99th percentile (of the daily worst hour)[10] averaged over 3 years (the form adopted by the USEPA) with some stakeholders stating that the numerical value should be set at 60 ppb[11]. While many (particularly form) submissions suggested a standard of 60 ppb, it was unclear in those submissions what form the standard should take although it was logically assumed that they were also suggesting the 99th percentile of the daily worst hour.

> *'Limiting the 99th centile of daily worst hour to 60 ppb is expected to prevent any 10-minute period exceeding 200 ppb. The 99th centile of daily worst hour at 60 ppb corresponds to a worst hour value of 88 ppb so our proposal is slightly more stringent than the RIS, and is more robust as it is less subject to random variation.' (#1 Doctors for the Environment Australia)*
>
> *'We suggest that to regulate hourly SO_2 to the worst hour of the year is not an effective form for this standard. There are strong arguments to regulate to the 99th centile of the daily worst hour, and to average this over a rolling 3-year period as has been adopted by the United States Environment Protection Agency (USEPA)… The 99th centile of daily worst hour averaged over 3 years still focuses attention on the high levels for the respiratory irritant gases that are most likely to trigger asthma attacks but are statistically more robust and a much stronger basis for taking regulatory action.' (#1 Doctors for the Environment Australia)*
>
> *'Asthma Australia recommends NEPC adopts a new 1-hour SO_2 standard of 60 ppb as 99th centile of daily worst hour. A proportion of people with asthma experience negative effects (worsening inflammation in the lungs which leads to asthma symptoms, attacks and emergency health service use) with even short-term exposure of as little as 10 minutes at levels of 200 ppb. Further, observational studies have shown increased hospitalisations occur on days with high SO_2. Limiting the 99th centile of daily worst hour to 60 ppb will help prevent any 10-minute period exceeding 200 ppb.' (#21 Asthma Australia)*
>
> *'Australia should follow the precedents of the US and Canada in adopting the 99th centile of daily worst hour as the form…' (#33 Environmental Defenders Office of Australia)*

[10] The 99th percentile (of the daily worst hour) averaged over 3 years considers the daily highest hourly value averaged over a period of 3 years and excludes the highest 1%.

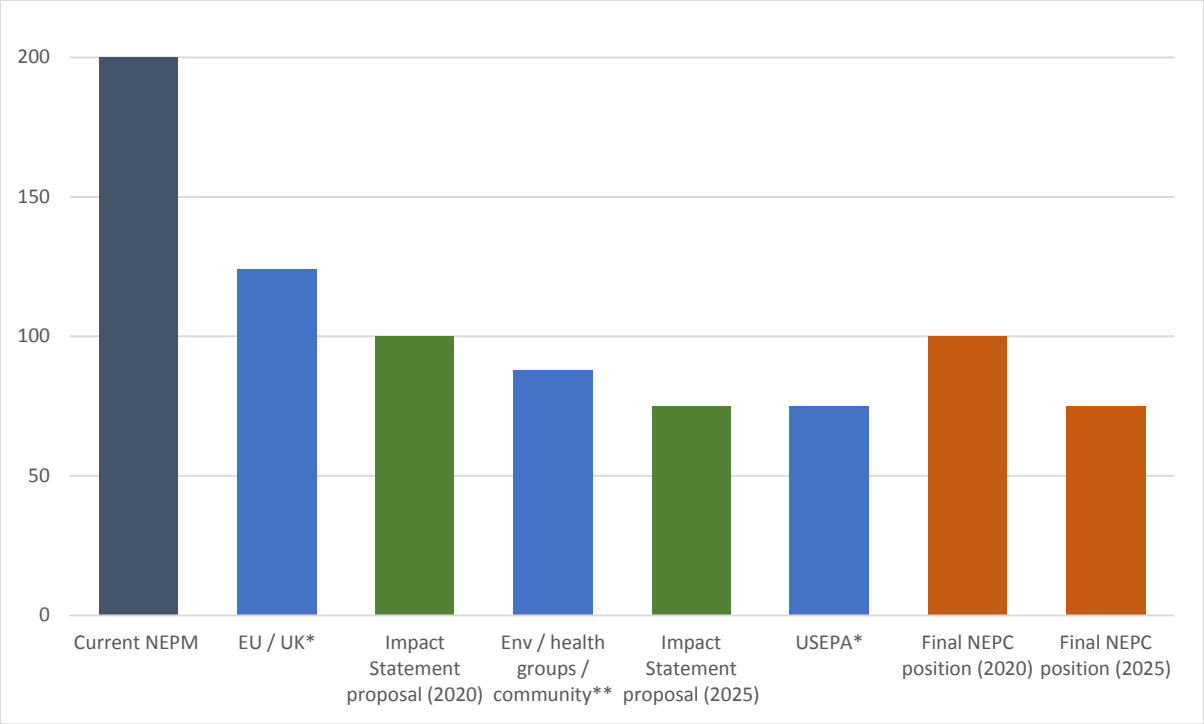
[11] This was proposed to roughly equate to a value in between the Impact Statement's proposals of 100 ppb and 75 ppb based off analysis of a small number of NSW NEPM stations (see submission #1 Doctors for the Environment Australia for more information).

Some industry submissions did not support the Impact Statement recommendations (either the 100 ppb or future 75 ppb standards, or both). Some submissions also suggested adoption of a standard similar to that set in the EU.

> *'The recommendation to lower the 1-hour SO_2 standard to 100 ppb in 2020 and 75 ppb by 2025 appears to be based on a USEPA approach which is based on limited health data. Alcoa facilities operating in the United States have reviewed the regulatory record and basis for setting the USEPA 75 ppb 1-hour standard. The 75 ppb standard was primarily based on controlled human exposure studies that showed that short-term exposure (5 – 10 minute) to SO_2 concentrations ≥200 ppb may cause adverse effects in sensitive populations (e.g., exercising asthmatics). The U.S. EPA standard was set on a 1-hour basis to address concerns about data management for a 5-minute standard and because of concerns about fluctuations in SO_2 concentrations. However, the 1-hour standard has resulted in unintended consequences for areas that may have hourly exceedances of 75 ppb, but low peak-to-mean concentrations such that there are no, or very few, 5-minute intervals above the 200 ppb health benchmark.' (#23 Alcoa Australia)*
>
> *'Rather than adopting a 100 ppb or 75 ppb 1-hour standard, it is recommended that the NEPM adopt the European Union's approach of a 1-hour standard at 350 µg/m^3 (134 ppb), allowing up to 24 1-hour exceedances per year. This approach more closely aligns with available health data than the proposed 75 ppb standard does. This approach also recognizes that SO_2 levels can fluctuate.' (#23 Alcoa Australia)*
>
> *'Recommendations 4 and 5 of the Impact Statement ask for the 1-hour standard for SO_2 of 200 ppb to be reduced to 100 ppb, and then 75 ppb starting from 2025. The Impact Statement reasons this new standard will ensure the protection of health because it puts Australia more in line with international benchmarks. The AEC believes this reason alone does not provide sufficient cause for such a reduction in concentration standards, and might have unintended consequences.' (#28 Australian Energy Council)*
>
> *'Given the absence of a material health benefit, the continued use of allowable exceedances by other leading countries and the relative infrequency of exceedances in Australia, it is the AEC's view that the proposed variations should provide for some allowable exceedances.' (#28 Australian Energy Council)*
>
> *'The proposed future 1-hour standard of 75 ppb – a 63% reduction over current levels – appears excessive given the Impact Statement found that the evidence for long-term health effects associated with SO_2 is weak. Future numerical values for the standard should be subject to further detailed review taking into account any new health evidence as well as existing international standards…Consideration should be given to adopting a value of 124ppm [sic], a less imposing 38 per cent reduction, which is in line with the standards of the European Union (EU), United Kingdom (UK) and New Zealand (NZ).' (#31 Cement Industry Federation)*

Note that some submissions expressed general concerns about the standards proposed and the potential impact of the application of these standards that could require significant financial investment, facility closure or reductions in production. While also relevant here, these views are summarised and addressed under Issue 14.

The figure below provides a summary of the range of standard options suggested through public consultation, the Impact Statement's proposals, a comparison to leading standards internationally, and NEPC's final recommendation for the standard.



* With some exceedances allowed.

** Approximately, when converted from 99th percentile (daily worst hour) based on some NSW stations – although this is likely to vary between jurisdictions.

Response

NEPC notes the range of public views regarding the numerical value of the 1-hour SO_2 standard and its form. Upon considering the views, NEPC's position is as follows:

Form of the 1-hour SO_2 standard

NEPC's position is that the form of the 1-hour SO_2 standard be the maximum value with no allowable exceedances.

NEPC notes the views raised regarding a 99th percentile approach for the 1-hour SO_2 standard to align with other organisations such as those set by the USEPA.

NEPC considers that the NEPM must be a transparent tool for jurisdictions to report compliance with the AAQ NEPM standards. NEPC believes that a maximum value with no allowable exceedances would be more transparent and adopting a percentile approach would mask actual peak measurements (once instrument error is considered).

Furthermore, the numerical value proposed for the 99th percentile approach was based on monitoring data from several stations in NSW only. Standards in this form are highly sensitive to variable concentrations and may end up being less protective than the Impact Statement's proposals.

The issue of allowable exceedances is discussed briefly in Issue 13. Allowable exceedances are contained in the AAQ NEPM for the purposes of jurisdictional reporting rather than applying to specific point sources.

Numerical value of the 1-hour SO_2 standard

NEPC's position is that:

- **The 1-hour SO_2 standard is retained and the numerical value of the standard be 100 ppb**
- **A future 1-hour SO_2 standard of 75 ppb should be introduced and take effect from 2025**
- **A review of the 1-hour SO_2 standard should commence in 2025, with the intention of tightening the standard in line with available evidence**

Adopting a 1-hour SO_2 standard of 100 ppb in the AAQ NEPM would make it among the most stringent in the world. NEPC considers that this is appropriate given the generally low levels of SO_2 experienced in Australia, and the lack of natural sources.

While a standard of 100 ppb is a significant reduction from the current standard of 200 ppb, the Impact Statement has shown that a 100 ppb standard is achievable now and in the future without the need for intervention. However, the achievability of this standard might be challenged with the proposed changes to clause 14, which should lead to more monitoring closer to vulnerable populations that are at risk of being harmed by air pollution.

Given the health evidence shows there is no threshold of effect for SO_2, NEPC supports the Impact Statement's recommendation that a future standard of 75 ppb to be introduced in 2025. The period before the introduction of 75 ppb allows some time for air quality management practices to be developed.

Concerns that 100 ppb and 75 ppb standards are overly stringent (and would lead to significant financial burden and potential closure of facilities) relate mainly to how jurisdictions apply the AAQ NEPM values during assessment of point sources. As discussed under Issue 3, the AAQ NEPM sets a nationally consistent monitoring, assessment and reporting framework – it is not intended for use in point source assessment without consideration of regulatory impacts. Jurisdictions consider how they use the AAQ NEPM values through their own regulatory decision-making processes. Some jurisdictional guidance that outlines the function of the AAQ NEPM and how it is intended to be used, will be provided in the explanatory statement for this AAQ NEPM variation.

NEPC supports a further review of the standard commencing in 2025. This will provide an opportunity to review the standards in line with the available evidence, including any updates to the WHO guidelines, acknowledging that tight standards can drive air quality improvement and the evidence shows there is no threshold below which adverse health effects are not observed. The proposal for a 2025 review is discussed further in Issue 20.

Issue 6 24-hour SO_2 standard

Impact Statement position

The current 24-hour SO_2 standard is 80 ppb with 1 allowable exceedance day per year. Based on the weight-of-evidence, the Impact Statement proposes:

- The 24-hour SO_2 standard should be retained and the numerical value should be reduced to 20 ppb
- No future target for 24-hour SO_2 concentration was recommended
- The form of the standards should be the maximum value with no allowable exceedances

Submissions

A handful of submissions (e.g. the Clean Air Society of Australia and New Zealand, #3) support the Impact Statement proposal of 20 ppb with no future target for 24-hour average SO_2 concentration.

Some submissions agreed with an immediate standard of 20 ppb but suggested that a standard of 7 ppb for 2025 is set now.

> *'[CAR agrees] with the proposed standard of 20 ppb. CAR recommends review with a future reduction to 7 ppb, consistent with WHO guidelines. "Health effects are now known to be associated with much lower levels of SO2 than previously believed. A greater degree of protection is needed. Although the causality of the effects of low concentrations of SO_2 is still uncertain, reducing SO_2 concentrations is likely to decrease exposure to co-pollutants."(WHO 2018) https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health.' (#5 Centre for Air Pollution, Energy and Health Research)*
>
> *'…Australia should set a goal to reach the WHO standard of 7 pp[b] for the SO_2 24-hour average by 2030 in all airsheds.' (#137 Beeliar Group)*

One industry submission supported alignment with international standards and a further detailed review prior to any further reduction.

> *'The proposed 24-hour standard for SO_2 represents a 75% reduction over the existing value and is not supported given the Impact Statement found that the evidence for long-term health effects associated with SO_2 is weak. Consideration should be given to aligning this standard with that of the EU and UK, i.e. 44 ppb. This still represents a significant reduction (45%).'*
>
> *'[The recommendation for no 2025 24-hour SO_2 standard] is supported by the CIF. Any future consideration of a target for 24-hour average SO_2 should be subject to detailed review taking into account any new health evidence as well as existing international standards.' (#31 Cement Industry Federation)*

The majority of submissions (including those from environmental and health groups and community) support a move to the WHO guideline of 7 ppb / 8 ppb[12] immediately.

> *'The evidence behind the WHO 1-day standard is convincing, strongly influenced by the evidence from Hong Kong when a policy of low sulphur fuel introduction simultaneously for both transport and electricity led to substantial health improvements. The WHO standard is*

[12] Note difference in 7 ppb (used in impact statement) vs. 8 ppb by submitters is difference in conversion of WHO guideline from 20µg/m^3 to ppb at different temperatures and rounding. Impact statement used conversion at 0°C to be consistent with references in the AAQ NEPM at 0°C and absolute pressure. Health groups have used conversion at 25°C which gives 7.6 ppb and then rounded to 8 ppb.

set as 20 µg/m^3 which is 7.6 ppb rounding to 8 ppb as the value Australia should adopt.' (#1 Doctors for the Environment Australia)

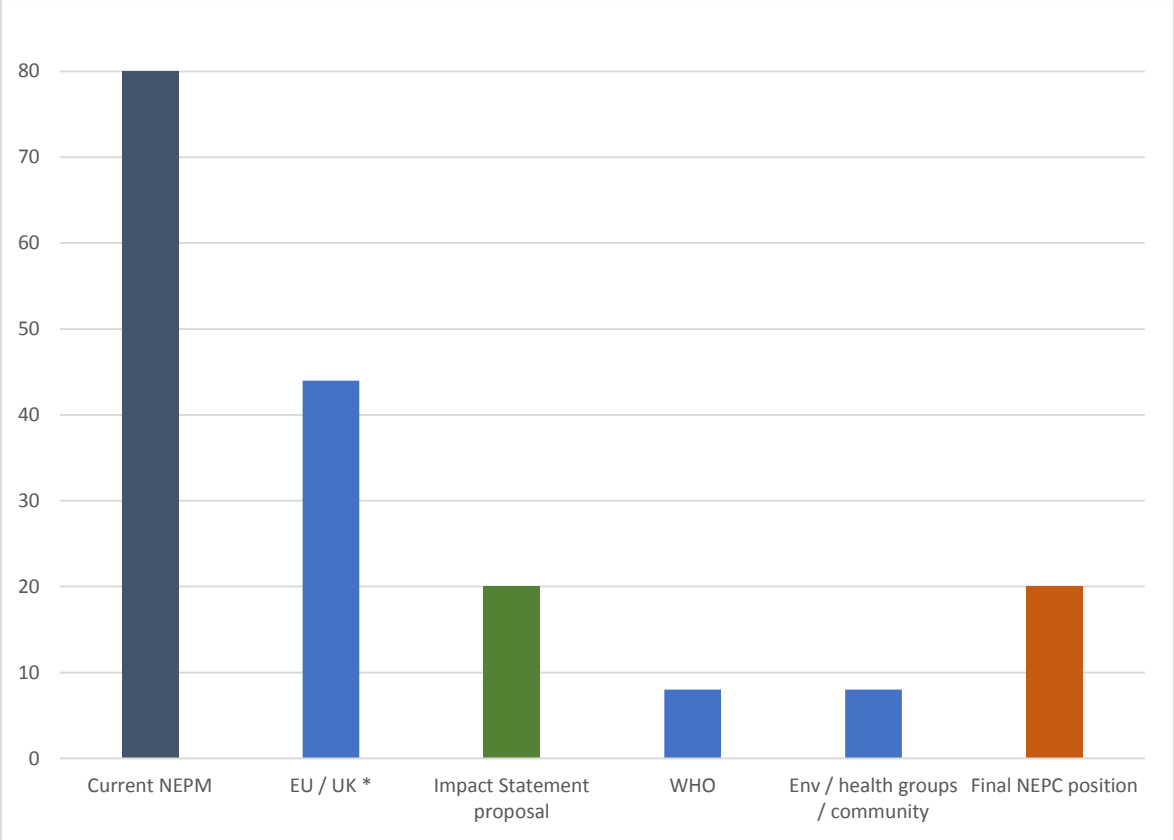
'While the proposed standards will go some way to improving air quality outcomes, in our opinion stronger standards are required. We strongly support the adoption of the World Health Organization (WHO) 1-day SO_2 standard of 8 ppb... Australia's current 24 h SO_2 standard of 80 ppb is 10 times higher than the recommended WHO standard' (#33 Environmental Defenders Office of Australia)

'The World Health Organisation (WHO) has set a 1-day SO_2 standard of 8 ppb, a measure which countries across the world have adopted, including many developing countries that can only imagine the prosperity that Australia is currently enjoying. Australia's current 1-day SO_2 standard of 80 ppb is 10 times that recommended by the WHO. I believe the NEPM review is a fantastic moment to update our SO_2 standards, as well as other standards which are now grossly out of date, in line with the rest of the world.' (#68 Dr David Yap)

'Make the 24-hour standard for SO_2 a compliance standard of 8 ppb, in line with the World Health Organisation standard set in 2005. Australia's current 24-hour SO_2 standard of 80 ppb is 20 times higher than the WHO standard. The governments' proposed standard of 20 ppb is still two and a half times higher than the WHO standard.' (#362 Latrobe Valley Sustainability Group plus other submitters)

The majority of the submitters who commented on the form of the standards preferred the maximum value.

The figure below provides a summary of the range of standard options suggested through public consultation, the Impact Statement's proposals, a comparison to leading standards internationally, and NEPC's final recommendation for the standard.



* With some exceedances allowed.

Response

Upon consideration of public views, **NEPC's position is that:**

- **The 24-hour SO_2 standard is retained and the numerical value of the standard be 20 ppb**
- **A review of the 24-hour SO_2 standard should commence in 2025, with the intention of tightening the standard in line with available evidence**
- **The form of the SO_2 standard be the maximum value with no allowable exceedances**

A standard of 20 ppb would be largely achievable and provide a modest health benefit. A standard of 7 ppb / 8 ppb would provide greater health benefits but would not be achievable in many jurisdictional airsheds without substantial new abatement policies.

NEPC acknowledges that the literature supports an association between SO_2 exposure and short-term effects on the respiratory system. However, in making the decision, it was important for NEPC to consider that:

- The final decision should be based on a range of criteria that includes health protection of the standard but also includes other aspects such as guidance from WHO (on considerations when adopting WHO guidelines as jurisdictional standards), standards adopted in leading jurisdictions (e.g. USA, Canada, EU, UK), the capacity of Australian jurisdictions to meet standards, and the effectiveness and efficiency of abatement options
- The 20 ppb standard proposed would be among the tightest standards in the world – tighter than those in place in the EU and UK (44 ppb and allowing 3 exceedance days per year)

although less stringent than the WHO guideline value. Importantly however, the WHO guideline value is set solely upon consideration of health which contrasts with the NEPM standard setting approach. The WHO states:

> *'National standards will vary according to the approach adopted for balancing health risks, technological feasibility, economic considerations and various other political and social factors…'*

NEPC supports a further review of the standard in 2025. This will provide an opportunity to review the standards in line with the available evidence acknowledging that tight standards can drive air quality improvement and the evidence shows there is no threshold below which adverse health effects are not observed.

NEPC considers a maximum value with no allowable exceedances is the most appropriate form of the standard.

Issue 7 10-minute SO_2 standard

Impact Statement position

The Impact Statement outlines that the WHO recommends a 10-minute SO_2 guideline of 175 ppb. Leading jurisdictions have not set a 10-minute SO_2 standard given that short-term SO_2 peaks occur in proximity to major SO_2 sources to which most of the population are not exposed. Consequently, the Impact Statement proposes to retain the status quo and exclude a 10-minute SO_2 standard from the NEPM.

Submissions

Some submissions (such as from #3 Clean Air Society of Australia and New Zealand, #31 Cement Industry Federation and #137 Beeliar Group) supported the Impact Statement's proposal to not include a 10-minute SO_2 standard.

Some submissions suggested introduction of a 10-minute standard to align with the WHO to protect short-term peak exposures.

> *'WHO…recommends a 10-minute standard for SO_2. CAR recommends consistency with WHO and adoption of a 10 min standard for SO_2 of 175 ppb (500 µg/m^3). WHO states that "Studies indicate that a proportion of people with asthma experience changes in pulmonary function and respiratory symptoms after periods of exposure to SO_2 as short as 10 minutes". CAR recommends that SO_2 is measured in high-risk areas, for high-risk populations (e.g. asthmatics).' (#5 Centre for Air Pollution, Energy and Health Research)*

> *'The [WHO] currently sets a 10-minute SO_2 emission standard of 175 ppb and the AAQ NEPM should be consistent with the most stringent international standards…Lake Macquarie residents live near major sources of SO_2 and the 10-minute standard would minimise the risk of adverse health impacts for these residents who are potentially impacted by short term SO_2 peaks.' (#378 Lake Macquarie City)*

Note that Asthma Australia (#21) considered that setting a 1-hour SO_2 standard of 60 ppb in the form of the 99th percentile of daily maximums would protect for 10-minute exposures exceeding 200 ppb.

Response

NEPC's position is that the status quo of <u>not</u> including a 10-minute SO_2 standard in the AAQ NEPM should be maintained on the basis that:

- SO_2 levels are generally low in Australia with the highest levels occurring as short-term peaks close to industrial sources rather than in areas that would capture generally representative ambient air quality
- While the proposed changes to the NEPM to focus on risk may lead to monitoring in areas closer to pollution sources, the NEPM it is not intended to be for hotspot monitoring of industrial emissions – jurisdictions have this responsibility through their own state-based monitoring requirements
- Leading international jurisdictions do not have a 10-minute SO_2 standard

Issue 8 1-hour NO_2 standard and form

Impact Statement position

The current 1-hour NO_2 standard is 120 ppb with 1 day per year allowable exceedance.

Based on the weight-of-evidence, the Impact Statement proposes:

- The 1-hour NO_2 standard should be retained and have a numerical value of 90 ppb
- A future 1-hour NO_2 standard of 80 ppb for implementation from 2025 as part of an exposure-reduction framework (this timeframe is consistent with the goals for $PM_{2.5}$ in the AAQ NEPM)
- The form of the standard should be the maximum value with no allowable exceedances

Submissions

Some submitters supported the Impact Statement proposal of 90 ppb now and 80 ppb in the future, however most submitters supported a move to 72 ppb with the form as the 99th percentile of the daily worst hour averaged over 3 years. While many (particularly form) submissions suggested a standard of 72 ppb, it was unclear in those submissions what form the standard should take although it was logically assumed that they were also suggesting the 99th percentile of the daily worst hour.

> *'Australia should follow the precedents of the US and Canada in adopting the 99th centile of daily worst hour as the form for both 1-hour SO_2 and NO_2 standards… Our proposal is the equivalent of the RIS proposal expressed as a 99th centile of daily worst hour.' (#1 Doctors for the Environment Australia)*

> *'We favour a consistent approach using a 99th percentile approach to standard setting. Such an approach reduces the effect of outliers and has the potential to demonstrate progress of the effectiveness of actions taken to reduce exposure… Such an approach is particularly important when comparing one hourly values which can be particularly volatile. It is also likely to be a more consistent approach when comparing modelled and actual exposure levels. We note that it is also the approach favoured by the USEPA.' (#40 Port Adelaide Resident's Environment Protection Group)*

'As to the actual level we support a compliance level using 72 ppb of the daily worst hour. It is critical to set standards which have real effect. Setting standards higher than measured atmospheric levels does not only fail to drive change, but can also lead to worsening health impacts when exposure is allowed to creep up to regulated levels.' (#40 Port Adelaide Resident's Environment Protection Group)

'...for SO_2, [Australia Conservations Foundation] ACF's recommended measure for a one-hour standard is based on 99th centile of daily worst hour as recommended by health experts rather than yearly worst hour as proposed in the NEPM impact statement. We note that 90 ppb is proposed in the impact statement, and that 80 ppb is noted for 2025. We recommend not delaying until 2025, and instead proposing 72 ppb expressed as a 99th centile of daily worst hour for the compliance standard. (#26 Australia Conservation Foundation)

Some submissions such as #5 (Centre for Air Pollution, Energy and Health Research) indicated a preference to move to the 2025 target of 80 ppb immediately.

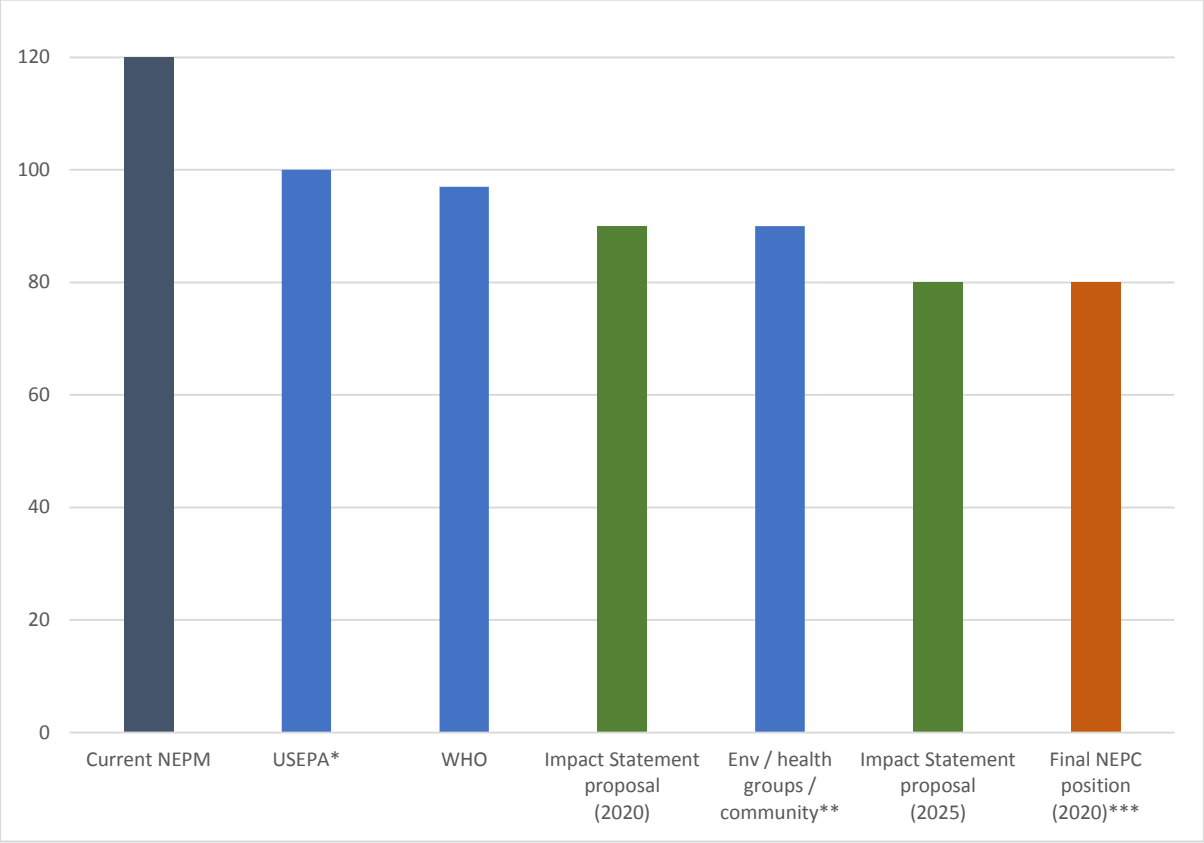
Some industry supported alignment with the WHO guideline, which is less stringent than the Impact Statement's proposal.

'...for the 1-hour nitrogen dioxide standard that is slated to drop from 120 ppb to 90 ppb – would make it the strictest standard in any country of the world – serious consideration should be given to adopting a value of 97 ppb, which is still a significant reduction and again in line with the standards of the European Union, the United Kingdom and New Zealand.' (#31 Cement Industry Federation)

Some industry submissions expressed concern that the future standards are disproportionately stringent and should be reviewed before they are set. For example, for NO_2:

'The proposed future 1-hour NO_2 standard of 80 ppb – a 33% reduction over current levels – appears excessive and does not align with international standards at this point in time. Future numerical values for the standard should be subject to further detailed review taking into account any new health evidence as well as existing international standards.' (#31 Cement Industry Federation)

The figure below provides a summary of the range of standard options suggested through public consultation, the Impact Statement's proposals, a comparison to leading standards internationally, and NEPC's final recommendation for the standard.



* With some exceedances allowed.

** Approximately, when converted from 99th percentile (daily worst hour) based on some NSW stations – although this is likely to vary between jurisdictions.

*** No 2025 value proposed, but further review to commence in 2025.

Industry generally supported maintaining allowable exceedances (see Issue 13).

Response

NEPC notes stakeholder views for the numerical value of the 1-hour NO_2 standard and its form. Upon consideration of public views, **NEPC's position is that the form of the 1-hour NO_2 standard be the maximum value with no allowable exceedances** with the rationale being consistent with that provided for the 1-hour SO_2 standard (Issue 5).

NEPC also recommends that:

- **The 1-hour NO_2 standard is retained and the numerical value of the standard be 80 ppb**
- **The review of the 1-hour NO_2 standard should commence in 2025, with the intention of tightening the standard in line with available evidence**

As previously stated, the final recommendations are based on consideration of the weight-of-evidence to support new standards, which includes consideration of health protection, standards adopted elsewhere in the world, and achievability.

NEPC considers that bringing forward the Impact Statement's proposed 2025 level of 80 ppb is appropriate given the evidence that shows there is no threshold for health effects from NO_2 exposure and that a more stringent standard set now would better protect health.

A standard of 80 ppb will be amongst the most stringent in the world (more stringent than the WHO guideline value of 97 ppb). However, in the Australian context, 80 ppb is generally achievable without the need for the introduction of abatement policies and is predicted to be in the future.

Importantly, the achievability of this standard may be challenged as the proposed changes to clause 14 may lead to more monitoring closer to vulnerable populations that are at risk of being harmed by air pollution.

NEPC notes stakeholder concerns that the proposed standards are overly stringent. However, NEPC considers the weight of evidence supports the updated proposal. NEPC notes that some concerns could be related to the use of AAQ NEPM standards as point source targets by jurisdictions. As discussed in Issue 3, guidance will be provided in the explanatory statement to clarify the intent of the NEPM standards.

NEPC's position it that a review of the 1-hour NO_2 standard in 2025 may identify an opportunity to strengthen the standard in line with the available evidence.

NEPC supports stakeholder proposals for consideration of a near-road monitoring program to provide an evidence base for consideration of roadside air quality management and assessment but proposes that this be considered by NATAG. This is described further in Issue 18.

Issue 9 Annual NO_2 standard

Impact Statement position

The current annual NO_2 standard is 30 ppb with no allowable exceedances. Based on the weight-of-evidence, the Impact Statement proposes:

- The annual NO_2 standard should be retained and have a numerical value of 19 ppb
- A future annual NO_2 standard of 15 ppb for implementation from 2025 as part of an exposure-reduction framework (this timeframe is consistent with the goals for $PM_{2.5}$ in the AAQ NEPM)
- The form of the standards should be the maximum value with no allowable exceedances

Submissions

Some submitters supported the NEPC proposal of 19 ppb now and 15 ppb in 2025; however, most submitters supported a move to 9 ppb with no exceedances.

> *'Our proposed annual NO_2 standard [of 9 ppb] is considerably stricter than existing standards, reflecting the strong evidence from ACHAPS [the Australian Child Health and Air Pollution Study] of its role in childhood asthma. The role of NO_2 in damaging child cognitive development is less certain but of great community importance if it is causative.' (#1 Doctors for the Environment Australia)*

> *'We strongly support… a new annual standard for NO_2 of 9 ppb… which has been demonstrated to have a substantial effect in reducing children's asthma when implemented in Australian schools.' (#33 Environmental Defenders Office of Australia)*

> *'CAHA [Climate and Health Alliance] recommends … the nitrogen dioxide annual exceedance limit to 9 ppb, in line with modern scientific evidence.' (#36 Climate and Health Alliance)*

'Local research indicates NO_2 levels about 9 ppb may contribute to worsening of childhood asthma. A new annual standard of 9 ppb should replace the current standard of 30 ppb to ensure standards are kept in line with current evidence and the health of Australia's children is prioritized.' (#69 Taylor Watson)

One industry submission supported the NEPC proposal of 19 ppb immediately.

'The recommendation to reduce the annual standard for NO_2 to 19 ppb, while a significant change, does align with other international standards.' (#31 Cement Industry Federation)

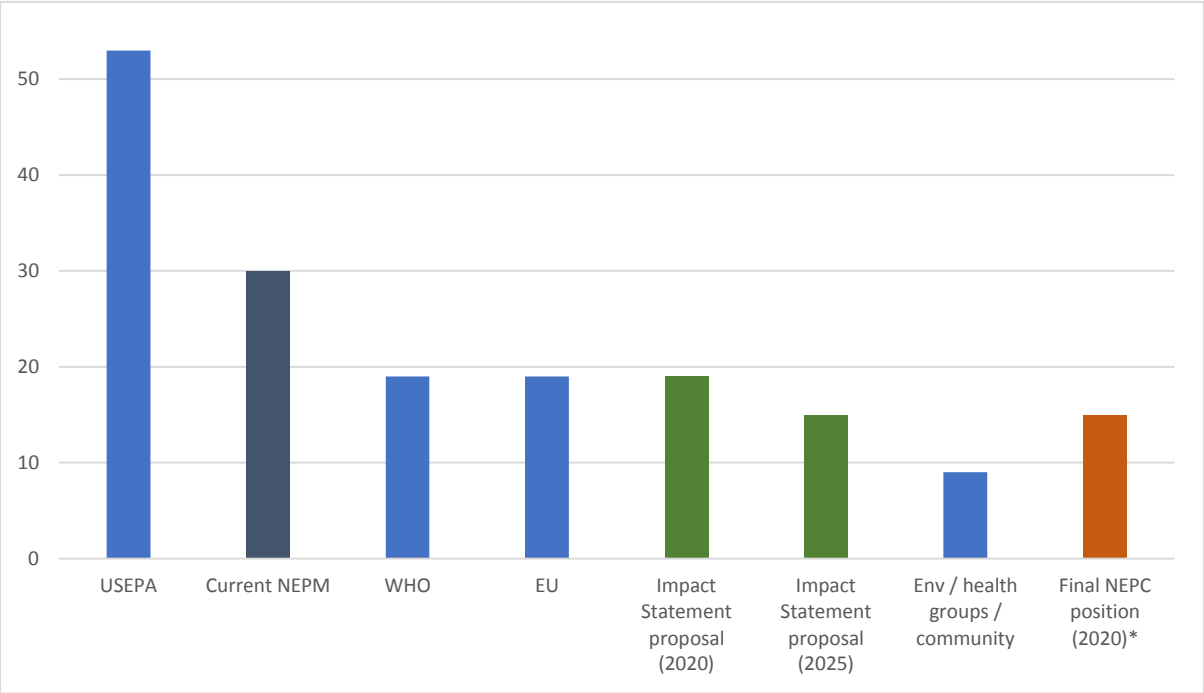
One submission supported a move to 15 ppb immediately rather than an 'interim' standard of 19 ppb.

'[CAR] recommend a move to 15 ppb immediately. An annual average level of 15 ppb is highly achievable in most urban areas. As a result, halving the guideline level to 15 ppb may not have a substantial benefit re: general ambient exposures, but if contemporaneous and widespread exposure reduction occurs, including along busy roads, then there should be benefits…' (#5 Centre for Air Pollution, Energy and Health Research)

'From a health perspective, Australian studies indicate that exposures to annual average NO_2 concentrations around 8 ppb and lower were associated with increased risk of prevalent asthma and decreased lung function in children (ACHAPS study; (Knibbs et al. 2018). … A study of Tasmanian adults with annual mean exposure to 5.1 ppb NO_2 reported an increased risk of atopy (allergy) & current wheeze with an increase in interquartile NO_2 levels (Bowatte et al. 2016)). These studies demonstrate adverse health outcomes at the generally low levels of NO_2 already experienced. They strongly support the need for a continued exposure reduction approach to NO_2 to minimise health impacts.' (#5 Centre for Air Pollution, Energy and Health Research)

The majority of the submitters who commented on the form of the standards preferred the maximum value.

The figure below provides a summary of the range of standard options suggested through public consultation, the Impact Statement's proposals, a comparison to leading standards internationally, and NEPC's final recommendation for the standard.



* No 2025 value proposed, but further review to commence in 2025.

Response

NEPC notes the range of views for the annual NO_2 standard. Upon consideration of public views, **NEPC's position is that:**

- **The annual NO_2 standard is retained and the numerical value of the standard be 15 ppb**
- **A review of the annual NO_2 standard commences in 2025, with the intention of tightening the standard in line with available evidence[13]**
- **The form of the standard is the maximum value with no allowable exceedances**

An annual NO_2 standard of 15 ppb would be among the most stringent in the world – more stringent than the WHO guideline value of 19 ppb, and more than the standards in place in leading countries such as the UK and the US.

The analysis of monitoring and modelling data in the Impact Statement showed that an annual NO_2 standard of 15 ppb can be met at existing NEPM stations without additional abatement. Importantly however, as for the other standards and pollutants, changes to clause 14 of the AAQ NEPM may lead to more monitoring closer to vulnerable populations that are at risk of being harmed by air pollution, which might challenge the achievability of a 15 ppb standard. Therefore, NEPC considers this standard (rather than reducing the standard to 9 ppb) is the most appropriate at this time.

NEPC considers that tightening the standard from 30 ppb to 15 ppb (rather than the Impact Statement's immediate proposal of 19 ppb) is appropriate given that 15 ppb is currently achievable without the need for introduction of additional abatement policies, and the evidence shows no

[13] This is particularly important in the case of the annual NO_2 standard as the evidence base for the health effects from long-term exposures continues to emerge.

threshold of effect from exposure to NO_2 – therefore a tighter standard set immediately may support greater health protection.

NEPC notes that whilst some of the studies raised through public consultation examined NO_2, the study authors often could not conclusively confirm that the effect was due solely to NO_2, but that NO_2 could be a marker for traffic related air pollution (TRAP). NEPC also notes that action to reduction NO_2 may lead to reductions in TRAP.

NEPC considers it prudent to review the standard again in 2025 for continuous improvement and given concerns about the infrequency of reviews. This would allow for the publication of more studies and the advice of bodies such as the WHO.

NEPC considers maximum value with no allowable exceedances is the most appropriate form of the standard.

As discussed under Issue 18, NEPC supports the establishment of a near road monitoring program.

Issue 10 8-hour O_3 standard

Impact Statement position

The Impact Statement proposes the introduction of an 8-hour O_3 standard based on standard setting trends observed internationally and that an 8-hour standard would be a controlling standard that can also enable 1-hour and 4-hour O_3 values to be met.

Specific for the 8-hour standard, the Impact Statement proposes:

- The 8-hour O_3 standard should have a numerical value of 65 ppb
- The 8-hour standard should be reviewed in 2025, with the option of reducing it once there is a better understanding of O_3 generation in capital city airsheds
- The form of the standards should be the maximum value with no allowable exceedances
- An exceptional event rule should be implemented for O_3, defined in a way that is consistent with the approach for PM_{10} and $PM_{2.5}$ in the AAQ NEPM

Submissions

Some submissions showed support for the Impact Statement's proposed introduction of an 8-hour O_3 standard set at a numerical value of 65 ppb.

> *'I support the NEPC recommendations for ozone levels to introduce rolling 8-hour standard of 65 ppb with a further review in 2025 in line with research.' (#157 Dr. Vicki Kotsirilos)*

> *'We support R19 [to introduce a rolling 8-hour standard and to set the numerical value at 65 ppb]…' (#137 Beeliar Group)*

Whilst most community submissions focused solely on the SO_2 and NO_2 standards, of those who commented on the O_3 standards, a large portion of them indicated a preference for a tighter standard – in line with the WHO guideline value.

> *'The 1998 NEPM sets a standard for both 1-hour and 4-hour ozone, which is proposed to be replaced by an 8-hour standard, bringing Australia into line with other jurisdictions… The time profile of ground level ozone is highly predictable with a peak during each afternoon,*

the peaks being higher and longer in summer. An 8-hour rolling average is a suitable time profile to capture these peaks, providing some evidence to support the adoption of an 8 hour rolling average in the NEPM…PHAA recommends an 8-hour standard of 47 ppb, in line with the World Health Organization's recommendations'. (#27 Public Health Association of Australia)

'Additionally, CAHA recommends the ozone 1-hour threshold be reduced to 70 ppb and an 8-hour threshold to be introduced at 47 ppb in line with World Health Organization recommendations.' (#36 Climate and Health Alliance)

'There is currently no NEPM 8-hour average compliance standard for O_3. The NEPM variation proposes a standard of 65 ppb whereas the WHO adopted a standard of 47 ppb in 2005... The review of the NEPM should set the Australian 8-hour average standard for O_3 at 47 ppb to reflect international best practice.' (#12 Hunter Communities Network)

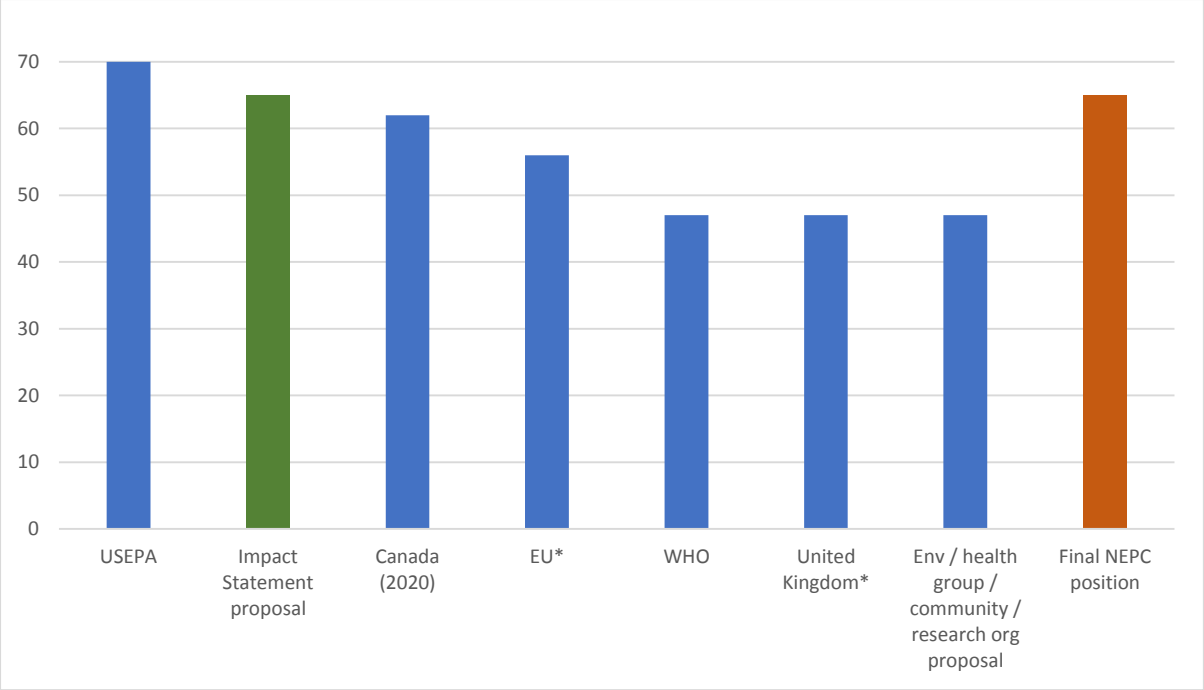
Some submissions showed a preference for no standard or a weaker standard than NEPC's proposal.

'For ozone, where an 8-hour standard of 65 ppb is recommended (despite this value not being investigated in the Impact Statement), it would seem more appropriate to maintain the status quo with a value of 70 pp[b] – which is aligned with the US. This would represent a more pragmatic approach that reflects the current levels of understanding of ozone (O3) generation in Australian capital cities and regional airsheds. Future values would be determined once more is known on this issue.' (#31 Cement Industry Federation)

However, one submission expressed concern that more health justification for an 8-hour standard was required.

'…we raise concern with the use of an 8-hour standard for ozone. We suggest that this proposal be justified through health studies before any implementation.' (#33 Environmental Defenders Office of Australia)

The figure below provides a summary of the range of standard options suggested through public consultation, the Impact Statement's proposals, a comparison to leading standards internationally, and NEPC's final recommendation for the standard.



* With some exceedances allowed.

Response

NEPC notes the range of views for the 8-hour O_3 standard. Upon consideration of public views, **NEPC's position is that:**

- **A rolling average 8-hour standard is introduced into the AAQ NEPM and the numerical value should be 65 ppb**
- **A review of the 8-hour standard should commence in 2025, with the intention of tightening the standard in line with available evidence**
- **The form of the standard is the maximum value with no allowable exceedances**
- **The standard be subject to an exceptional event rule whereby high pollution days that exceed the 8-hour standard, that are attributable to bushfires or land management practices, be excluded for determining compliance with the standard**
- **All 8-hour O_3 monitoring data and all exceedances, with and without exceptional events, be fully reported and described. See Issue 13 for further information on the proposed exceptional events rule**

As discussed in the Impact Statement, the 8-hour standard is common internationally and the evidence shows that an 8-hour standard would be a controlling standard that can also enable 1-hour and 4-hour O_3 values to be met.

NEPC considers that a numerical value of 65 ppb is appropriate for the following reasons:

- 70 ppb would be roughly equivalent to the current 1-hour standard of 100 ppb and would not show progress or improvement. NEPC considers this inappropriate given the prevailing evidence of the health effects of O_3. Analysis conducted in the Impact Statement shows that

an 8-hour O_3 standard of 65 ppb would likely lead to exceedances in most jurisdictional airsheds.

- A standard below 65 ppb, in particular, alignment with the WHO guideline value of 47 ppb, would be unachievable without a clear pathway to comply. Regarding WHO's 47 ppb standard, it is important to consider that the WHO guideline values are set based on consideration of health only, and not on a broader suite of considerations such as required through the *NEPC Act 1994*. Furthermore, Australia's climate promotes more O_3 generation than generally cooler countries, which is an important reason why these countries adopt more stringent standards.
- Without a clear path to compliance, setting a significantly stringent standard that leads to many exceedances would not provide any health benefit. For this reason, NEPC considers it appropriate to commence a review of the O_3 standard in 2025 once there is a better understanding of O_3 generation in capital city airsheds which will aid in the development of mitigation strategies.

Given the association between bushfire events and increased concentrations of O_3, many of which have led to exceedances of the 1-hour O_3 standard at NEPM stations, NEPC proposes that an exceptional events rule is introduced for the 8-hour O_3 standard[14] – consistent with what is in place in the US and with the rule for reporting and assessing compliance against the AAQ NEPM PM_{10} and $PM_{2.5}$ standards.

Issue 11 Removal of standards

Impact Statement position

The Impact Statement proposes the removal of the annual SO_2, 1-hour O_3 and 4-hour O_3 standards.

Annual SO_2 standard

The removal of the annual SO_2 standard is proposed given the lack of strong evidence for long-term health effects from exposure to SO_2, which has led the WHO to note that a long-term standard is not needed and international agencies to revoke annual average standards and focus on implementing short-term standards.

1-hour and 4-hour O_3 standards

The AAQ NEPM 1-hour and 4-hour O_3 standards were established in 1998. New health evidence has emerged since that time to guide the most appropriate averaging period for O_3. In particular, the Impact Statement discusses:

[14] Consistent with $PM_{2.5}$ and PM_{10}, an exceptional events rule for 8-hour O_3 would require reporting of all data associated with an exceptional event, but assessment of compliance against the 8-hour O_3 standard would exclude these events

- WHO's REVIHAAP project[15] which supported health estimates based on daily maximum 8-hour exposures and did not find evidence that a 1-hour standard provided any additional health protection
- USEPA's Policy Assessment for Ozone[16] that concludes that a standard with an 8-hour averaging time (combined with an appropriate standard form and level) would be expected to provide substantial protection against health effects attributable to 1-hour exposures
- The lack of epidemiological studies that focus on a 4-hour averaging period and the suitability of the 8-hour averaging period to represent daily exposure

The Impact Statement recommends that jurisdictions continue to record and report 1-hour O_3 concentrations given that the 8-hour averaging period is too long to allow community information warnings.

Submissions

All stakeholders who commented on the annual SO_2 standard supported its removal.

The majority of stakeholders also supported the removal of the 4-hour O_3 standard.

Some stakeholders supported the proposal to remove the 1-hour O_3 standard, for example the Clean Air Society of Australia and New Zealand (#3) and Beeliar Group (#137).

However, other stakeholders proposed that the 1-hour O_3 standard be retained, with many of these suggesting a numerical value of 70 ppb.

> *'Further, we raise concern with the use of an 8-hour standard for ozone. We suggest that this proposal be justified through health studies before any implementation. High levels of ozone for short periods (i.e. 1-hr) can cause breathing and other health difficulties for sensitive people. We suggest that the original 1-hour and 4-hour standard be maintained. This could be made a compliance standard of 70 ppb, in line with the New Zealand standard'*
> *(#33 Environmental Defender's Office of Australia)*

In their submission, the Centre for Air Pollution, Energy and Health Research (#5) pointed to findings in international health studies that could support a 1-hour O_3 standard and recommended that NEPC maintain a watching brief on international developments.

> *'We agree with the removal of the 4-hr standard for O_3, but recommend a watching brief with regard to a 1-hour maximum guideline for O_3. WHO REVIHAAP (2013) report provides evidence of studies published since 2005 which report increased adverse effects associated with 1-hour exposures to ozone… Given this, it is not clear to CAR that WHO will not instate a 1-hour guideline in the forthcoming revision of the WHO ambient air quality guidelines. However, we acknowledge that the Impact Statement highlights Australian data which shows that exceedances of the 8-hr criterion is more frequent than the 1-hr standard, thus*

[15] WHO (2013) Review of evidence on health aspects of air pollution – Technical Report http://www.euro.who.int/__data/assets/pdf_file/0004/193108/REVIHAAP-Final-technical-report-final-version.pdf

[16] USEPA (2014) Policy Assessment for Ozone https://www3.epa.gov/ttn/naaqs/standards/ozone/data/20140829pa.pdf

suggesting that the 8-hr standard will be protective of 1-hr excursions...' (#5 Centre for Air Pollution, Energy and Health Research)

Response

NEPC notes the views expressed in the submissions, particularly those related to the retention of the 1-hour O_3 standard.

NEPC's position is:

- **The current annual mean standard for SO_2 should be removed from the AAQ NEPM**
- **The current 1-hour and 4-hour standards for O_3 should be removed from the AAQ NEPM**
- **Jurisdictions should continue to record and report 1-hour O_3 concentrations (outside of the AAQ NEPM framework) for the provision of health alerts**

NEPC reiterates that leading jurisdictions do not have a 1-hour O_3 standard and the USEPA's position that an 8-hour averaging time would be expected to provide substantial protection against health effects attributable to 1-hour O_3 exposures.

NEPC considers that retaining a 1-hour O_3 standard would not provide additional protection above an 8-hour O_3 standard set at an equivalent level and would duplicate assessment and reporting effort.

NEPC supports the Impact Statement's recommendation to keep a watching brief on O_3 standard developments internationally, and in particular, any changes to the use of a 1-hour O_3 standard elsewhere for consideration in the 2025 review of the O_3 standard and in future reviews.

NEPC also reiterates the Impact Statement's proposal for jurisdictions to continue to record and report 1-hour O_3 concentrations to provide quick community health alerts in conjunction with an 8-hour standard. A health alert based on a 1-hour averaging time would be more responsive than 8-hours. Furthermore, recording and reporting 1-hour O_3 concentrations allows continued comparison to existing health studies which have focussed on the 1-hour averaging period.

Issue 12 Exposure reduction framework

Impact Statement position

The Impact Statement recommends an *exposure reduction framework* in the form of future standards to be introduced in 2025 for:

- 1-hour NO_2: Tightening the 1-hour NO_2 standard from 90 ppb (from commencement of the varied NEPM) to 80 ppb in 2025
- Annual NO_2: Tightening the annual NO2 standard from 19 ppb (from commencement of the varied NEPM) to 15 ppb in 2025

This exposure reduction approach strives for continuous improvement and aligns with the approach adopted for $PM_{2.5}$ in the 2015 NEPM variation.

Submissions

A number of submissions expressed support for the Impact Statement's exposure reduction approach. For example:

- #3 Clean Air Society of Australia and New Zealand
- #137 Beeliar Group
- #393 Australasian College for Emergency Medicine

Other submissions appeared to support the approach to set tighter future standards but called for them to be even tighter, and / or criticised setting weaker standards in the first instance.

> *'An exposure reduction and continuous improvement model is recommended for all exposed populations... Strong health-based standards are required now to minimise ongoing damage to the health of Australians. There is no rational basis for proposing a weak standard now and a tighter standard in future.' (#4 Environmental Justice Australia)*

> *'In the RIS exposure reduction framework is taken to mean lowering the standard in the future such as in 2025. It makes far more sense to choose a health-based standard now and work towards compliance by 2025.' (#1 Doctors for the Environment Australia)*

Some submissions conveyed that a broader exposure reduction framework beyond standards is needed.

> *'The NEPM should include an emissions reduction framework designed to continually reduce pollution to as close to zero as possible, not set a slightly less weak standard for one pollutant in five years.' (#4 Environmental Justice Australia)*

> *'We strongly support the move toward an exposure reduction approach. This is consistent with the approach advocated by WHO. We would argue that the AAQ NEPM could be considered as one component of the strategy for reducing exposure to SO_2, NO_2 and O_3 in Australia. Indeed, we argue… for continuous exposure reduction, which requires action outside the AAQ NEPM.' (#5 Centre for Air Pollution, Energy and Health Research)*

> *'The term exposure reduction framework is misused throughout the document. An exposure reduction framework recognises that lowering pollution has value even when ambient air standards are met. An example would be a pollution fee system which imposes a fee per tonne of pollutant and provides an economic rationale for cleaner production even below a fixed standard.' (#1 Doctors for the Environment Australia)*

Some submissions disagreed with the Impact Statement's recommendation that an exposure reduction framework is not needed for SO_2.

> *'We recommend that an exposure reduction framework be considered for locations subject to elevated SO_2 concentrations. The Impact Statement does not justify the recommendation made. We point to the large populations of Perth and the Latrobe Valley as examples of major populations living in areas with elevated SO_2 concentrations. Exceedances in such locations should be addressed. For instance, monitoring stations could be preferentially placed near locations with sensitive populations, such as child care centres, schools and hospitals, within high risk areas, to allow reporting on SO_2 across all recommended averaging periods.' (#5 Centre for Air Pollution, Energy and Health Research)*

> *'We strongly support exposure reduction targets as these will help us to reach appropriate standards for problem airsheds. We suggest that the NEPC should recommend that States should implement exposure reduction measures for problem airsheds.' (#137 Beeliar Group)*

Response

NEPC acknowledges the evidence that suggests that there is no threshold for these pollutants and notes the range of views regarding the need and approach to drive exposure reduction and continuous improvement in the standards to protect health.

NEPC's position is:

- **A review of the SO_2, NO_2 and 8-hour O_3 standards commences in 2025, with the intention of tightening the standard in line with available evidence**
- **Jurisdictions should commence annual reporting on population exposure to NO_2 and O_3 from the commencement of a varied AAQ NEPM**

Upon consideration of public views, NEPC proposes to update the Impact Statement's exposure reduction framework approach to recognise that it is broader than standard setting.

Continuously strengthening air quality standards is important to improve ambient air quality. As such**, NEPC proposes to review the SO_2, NO_2 and O_3 standards again in 2025** to provide an opportunity to assess appropriate new standards.

NEPC also proposes to progress the Impact Statement's recommendation to report population exposure annually for NO_2 and O_3 (consistent with the approach for $PM_{2.5}$). This provides a metric upon which future action to reduce exposure can be based. Note that, as per $PM_{2.5}$, jurisdictions will need to agree on the approach to report population exposure.

NEPC acknowledges views that NEPM standards are only one part of an effective framework, and that the standards should be complemented by other emission reduction measures. Consequently, NEPC considers that other measures to reduce population exposure could be explored through appropriate actions pursued through the National Clean Air Agreement, or actions based on jurisdictional regulatory decision-making processes.

Issue 13 Exceptional events rule and allowable exceedances

Impact Statement position

The Impact Statement recommends the removal of the allowable exceedances rules for the 1-hour and 24-hour SO_2 standards and for the 1-hour NO_2 standard and the introduction of an exceptional events rule for the rolling 8-hour O_3 standard. The exceptional events rule would be consistent with the rule for PM_{10} and $PM_{2.5}$ that was introduced under the variation to the AAQ NEPM in 2015, that is:

- High pollution days that exceed the 8-hour standard, that are attributable to bushfires or land management practices, can be excluded for determining compliance with the standard.
- All 8-hour O_3 monitoring data and all exceedances, with and without exceptional events, shall be fully reported and described.

The Impact Statement does not propose an exceptional events rule for SO_2 and NO_2 based on the absence of any association between bushfires and elevated levels for these pollutants.

The Impact Statement also recommends the removal of the allowable exceedance rule for CO. See Issue 23 for more detail on this recommendation.

Submissions

Some submitters support the removal of 'allowable exceedances'.

> *'We support the removal of "allowable exceedances" and their replacement with "exceptional events", which will need to be justified as an unavoidable cause for an exceedance e.g. bushfire events.' (#5 Centre for Air Pollution, Energy and Health Research)*

Some industry submissions expressed the need for 'allowable exceedances'.

> *'Origin urges the NEPC to... consider a smaller reduction in numerical value of the AAQ NEPM for all pollutants in the review as well as providing for allowable exceedances or exceptional events.' (#35 Origin)*

> *'ASBG recommends the AAQ NEPM adopt allowable exceedances for SO_2, NO_2, Ozone and $PM_{2.5}$ as consistent with the EU or North America.' (#32 Australian Sustainable Business Group)*

> *'Given the absence of a material health benefit, the continued use of allowable exceedances by other leading countries and the relative infrequency of exceedances in Australia, it is the AEC's view that the proposed variations should provide for some allowable exceedances. This is consistent with world's best practice as evidenced by the various international standards cited in the Impact Statement, and consistent with the latest World Health Organisation air quality guidelines, which acknowledge that standards can be developed with an allowable number of exceedances.' (#28 Australia Energy Council)*

> *'The analysis presented to support the proposed variation does not sufficiently demonstrate that there is a problem of decreasing air quality sufficient to warrant imposing caps with no allowable exceedances.' (#24 Australian Aluminium Council)*

One industry submission opposed the proposal to remove allowable exceedances and argued for an exceptional events rule for NO_2.

> *'The complete removal of allowable exceedances is not supported. By international standards Australia's existing allowable exceedance of 1 day per year is already amongst the strictest in the world for 1-hour and 24-hour forms of the standard. This recognises the impracticalities and costs (to both Government, industry and the community) of acting on a single exceedance… an exceptional event rule should be implemented for NO_2, defined in a way that is consistent with the approach for PM_{10} and $PM_{2.5}$ in the AAQ NEPM.' (#31 Cement Industry Federation)*

One submission supported the exceptional events rule for O_3 emphasising that jurisdictions should separate natural and human-made sources.

> *'…any form of O_3 standard should ensure that adequate methods are adopted to separate the biogenic sources (particularly bushfires) from anthropogenic sources. For an exceptional events rule to be introduced, then statistics should be available and explained with and without the excluded events. This approach is readily understood by the public and will allow for jurisdictions which do not demonstrate any exceedances to reassure communities that the performance of the regulatory system is adequate.' (#20 Mobil)*

Some submissions expressed concern that the definition of 'exceptional events' has not been extended to SO_2 and NO_2. For example:

> *'The exceptional events rule is proposed for O_3 but not SO_2 or NO_2. The Impact Statement reasons that an "exceptional event" clause for SO_2 and NO_2 emissions is unnecessary since it cannot foresee any exceptional events in the future. From the AEC's perspective, an "exceptional event" clause is in place for this very reason: to allow for an unforeseeable event.' (#28 Australia Energy Council)*

Response

NEPC wishes to emphasise that the 1-day allowable exceedance rules currently in the AAQ NEPM for the 1-hour and 24-hour SO_2 standards and 1-hour NO_2 standard are for jurisdictional reporting and assessment of compliance with the AAQ NEPM standards. They are not to be taken to be an exemption for industry from meeting the standards, or to be translated into jurisdictional assessment or licensing criteria.

Similar to the view taken in the AAQ NEPM Particles Review, NEPC considers that the application of the allowable exceedance days to anthropogenic pollution events, irrespective of whether 'exceptional' events have actually occurred, is inconsistent with the original intent of the AAQ NEPM. It is also NEPC's view that any days explicitly exempted from the data set should be bound by rules.

Consequently, **NEPC's position is that the allowable exceedance rules for these pollutants are removed and exceptional events rules for SO_2 or NO_2 are not required** given the low potential that it will be needed for these pollutants, particularly for SO_2 given the lack of elevated levels associated with natural sources in Australia. While bushfires may elevate local NO_2 levels, NEPC's position is that no exceptional exceedance rule for NO_2 is needed given the lack of a strong statistical association linking bushfires and elevated NO_2 concentrations at a regional scale.

O_3 is a secondary pollutant that is formed through the chemical reaction between nitrogen oxides and volatile organic compounds (VOCs) in the presence of sunlight. Bushfires release large amounts of O_3 precursors and consequently may also lead to peaks in O_3.

As outlined under Issue 10, **NEPC's position is that all 8-hour O_3 monitoring data and all exceedances, with and without exceptional events (as defined in the NEPM), shall be fully reported and described** given that exceedances of the O_3 standards are associated with major fire events in many jurisdictions.

Issue 14 Comments on technical aspects

Impact Statement position

The Impact Statement drew from three technical studies: an Air Quality Study, Health Risk Assessment (HRA) and Cost-benefit Analysis (CBA).

The overall review methodology is based on NEPC's 2011 *Methodology for setting air quality standards in Australia*[17]. The methodology was developed with input from all jurisdictions via a

[17] NEPC (2011) Methodology for setting air quality standards in Australia – Part A: http://www.nepc.gov.au/system/files/resources/458719dc-73eb-4cfd-a688-a36b32e80f6c/files/methodology-air-quality-standards-australia-parta.pdf

Policy Working Group. The review adopted an Impact Pathway Approach[18] where possible, supplemented by a simpler damage cost approach where the required information was unavailable.

Air Quality Study

The Air Quality Study assessed historical air quality data from 2003 – 2016 to understand past and present air quality levels and trends and determine the number of exceedances for the standard options. The study also considered future air quality under a Business as Usual (BAU) scenario and an abatement package scenario for the years 2016, 2021, 2031 and 2040.

The BAU scenario included actions that were agreed nationally (such as action on wood heaters and non-road spark ignition engines) as well as assumptions on the introduction of more stringent vehicle emission standards and improved fuel quality (consistent with the BAU used in the 2015 review of the *Fuel Quality Standards Act*).

An abatement package was selected to improve air quality in the future and was modelled for NSW and VIC. Nine abatements were selected using a multi-criteria analysis. These abatements were modelled together in one package to account for the complex interactions between the pollutants. For example, measures to reduce NO_2 influence O_3 concentrations as NO_X (which includes NO_2) is an O_3 precursor.

Health Risk Assessment

The HRA calculated:

- The health burden attributable to each of the pollutants based on historical concentrations
- The future health burden under both the BAU and abatement package scenarios
- The number of health outcomes that would be avoided if the potential standards could be met

Both long-term (chronic) and short-term (acute) effects on health were considered.

The selection of concentration response functions (CRF's) was informed by preliminary work undertaken by Jalaludin and Cowie (2012) and the World Health Organization.

Cost-benefit Analysis

The CBA provided estimates of:

- The cost of the existing health burden for SO_2, NO_2 and O_3 (in 2016 dollars) based on the HRA data for 2010–2014
- The costs and benefits of an abatement package scenario

The assessment of costs and emission reductions was based on publicly available data. The monetary benefits were estimated based on the health outcomes from the HRA.

The CBA tested a range of assumptions used (such as abatement costs) through sensitivity analysis.

[18] The Impact Pathway Approach is a best practice method for identifying the effects of air pollution, from changes in emissions through to impacts on outcomes that society values (Defra, 2013)

Submissions

Comments on overall approach

Some submitters thought the assessment was too spatially limited and should have included additional airsheds or areas of high pollutant sources to better reflect impacts on communities.

> *'The City of Sydney does not consider that the analysis appropriately takes into account areas where air pollutant sources are prevalent including road traffic and shipping emissions, topographies including high-rise street canyons (which may significantly affect pollutant dispersion) and high transient population densities.' (#50 City of Sydney)*

> *'The CBA does not appear to be representative of the airsheds outside of the main city centres where multiple and diverse industries, that produce the emissions of interest, operate.' (#13 Queensland Resources Council)*

> *'The CBA relies on emissions data from the Sydney and Newcastle airshed but fails to examine the much higher emissions load for communities close to pollution sources such as coal fired power stations. Areas like Lithgow, Muswellbrook and Singleton are much more likely to experience spikes above Australian and world standards and thus calculations of costs for these communities will be many times higher.' (#39 Nature Conservation Council of NSW*

Some submissions questioned the value of the CBA as it did not measure the costs and benefits of meeting proposed standards, but instead measured the costs and benefits of an abatement package.

> *'The cost benefit analysis does not consider the economic impacts of either the proposed draft standards or the range of standards that have been proposed by the Air Thematic Oversight Group of various government officials. Instead, it is a cost benefit analysis of an 'abatement package' of nine potential policy measures, largely retrofitting industrial facilities.' (#26, Australian Conservation Foundation, quoting The Australia Institute)*

> *'We note that under section 15(b) of the National Environmental Protection Act, NEPC is to have regard to the environmental, social and economic impacts of a new measure. However, the cost-benefit analysis … has not modelled the various costs and benefits of achieving the set of standards recommended in the regulation impact statements or any other set of standards, but rather modelled the costs and benefits of a hypothetical abatement package. This has led to a conclusion of recommending weaker standards based on the false premise that reducing pollution will result in a net economic cost.' (#53 Greenpeace)*

One submission requested the CBA be redone to include consideration of the use of NEPM standards as target criteria by jurisdictions.

> *'…missing in the cost benefit study is consideration of how the AAQ NEPM standards would actually be applied. Adoption of these standards will add further costs on industry, in some cases to the point of closure, because the AAQ NEPM standards have for some time been enforced as impact criteria, rather than an ambient standard, on industrial sites in most jurisdictions. This difference in enforcement…appears to be ignored in the NEPM process... ASBG considers the reassessment of how AAQ NEPM standards are applied should trigger a reconsideration of the recommendations in the Impact Statement consider the likely costs*

these changes would impose and the low cost-effectiveness of their enforcement, especially on existing sites.' (#32 Australian Sustainable Business Group)

Comments on health assumptions and approach

Some submissions suggested a list of Australian studies that were referred to in an 'Expert Position Statement' from health experts be considered.

> *'An expert position statement released on 6 August cites a list of recent studies. The statement… was organised by health and pollution experts from a range of organisations including the Lung Health Research Centre, Doctors for the Environment Australia, Royal Australasian College of Physicians, Lung Foundation of Australia, Climate and Health Alliance, Melbourne Energy Institute, Environmental Justice Australia, Clean Air and Urban Landscapes Hub, Melbourne Sustainable Society Institute, Royal Melbourne Hospital and the Peter MacCallum Cancer Centre. These experts also provide a joint recommendation on proposed standards. ACF encourages consideration of the recent reports that are outlined in the statement, their findings, and the standards proposed by these health experts.' (#26 Australian Conservation Foundation).*

One submission suggested an alternative CRF approach to improve the estimation of health burden in the HRA.

> *'We advocate the concentration response functions used for setting Australian standards should ideally use Australian CRF's. However this may not be possible for all health outcomes assessed due to a limited number of Australian studies. In some cases it may be possible to combine the Australian CRF's with the international CRF's to develop a summary CRF that gives additional weight to the Australian CRF's because of their relevance to the Australian context.' (#5 Centre for Air Pollution, Energy and Health Research)*

It also suggested changes to give higher order emphasis to CRF's that exclude a cut-off.

> *'We agree with the contention in the report that it is implausible that there are no adverse health effects below threshold levels. In view of this it is surprising that the report has preferentially applied concentration-response functions (CRFs) that make this assumption (labelled "Group 1 CRF" in the report). We would prefer to see the analysis based on concentration-response functions that assume no lower limit for the adverse health effects.' (#5 Centre for Air Pollution, Energy and Health Research)*

The submission also commented on the roll back method to determine the health outcomes avoided by meeting the standard options.

> *'The problem with the "roll back" approach to assessing the health outcomes avoided by meeting the standards (Impact Statement Section 4.7.4) is that it assumes that there are no health effects below the standard, and this is not the case.' (#5 Centre for Air Pollution, Energy and Health Research)*

Comments on abatement measures and cost assumptions

Some submitters commented on the selection of the abatement package suggesting alternatives should have been included.

'[T]he lowest cost pathway for most power stations would involve simply replacing energy generation at coal power stations with renewable energy and storage. Replacement of coal-fired power stations with renewable energy would also remove other toxic emissions, such as particle pollution, which caused a significant health burden on the community.' (#39 Nature Conservation Council of NSW)

'[Gas Energy Australia (GEA)] considers a higher initial benefit to cost ratio could be achieved by focussing on early actions to combat the release of these gases from sources in close proximity to where people live and work. For example, the Federal Government's 2012 Review of Emission Standards (Euro VI) for Heavy Vehicles Discussion Paper concluded that "air pollution from motor vehicles is particularly harmful for human health as the general population has a higher level of exposure to motor vehicle emissions than other pollutant sources".' (#34 Gas Energy Australia)

'Without a more realistic analysis of potential abatement options that demonstrates net benefits from proposed abatement packages, NEPC should not adopt standards any stricter than those proposed in the Impact Statement given there is no evidence they could be achieved cost effectively.' (#22 NSW Minerals Council)

'While a valid process for selecting [abatement measures] was used, it cannot be concluded that this package is comprehensive. It is noteworthy and an omission that the strategies did not include any interventions relating to reducing on-road vehicle numbers and kilometres travelled or improving public and active transport in general. This would seem to be an important potential area for mitigation that is not included.' (#5 Centre for Air Pollution, Energy and Health Research).

'[Alcoa of Australia Ltd recommend revising the] abatement package scenario to include non-industry measures and revise [the] CBA to consider abatement cost estimates provided by industry to inform the decision on proposed changes to standards (both numerical value and form).' (#23 Alcoa of Australia Ltd)

Some submitters commented that the economic benefits were underestimated as some health benefits (such as those deriving from the reduction of secondary particles) were not included, or that the costs were overestimated.

'The cost-benefit analysis has also completely ignored significant benefits of clean air beyond reduced rates of hospitalisation - including increased labour productivity, improved agriculture yields, and ecosystem benefits.' (#53 Greenpeace)

'The CBA acknowledges that there are potentially very significant benefits associated with reduction of SO_X and NO_X emissions that lead to the formation of secondary particulate matter. However, the analysis failed to quantify these benefits…It is clear that there would be an enormous benefit from reduction in $PM_{2.5}$ formation which is many times greater than the calculated direct benefit of reduced SO_X and NO_X.' (#39 Nature Conservation Council of NSW)

'…particle studies by ANSTO and predictive modelling by the Clean Air and Urban Landscapes Hub consortium and the New South Wales Office of Environment and Heritage have both

found that secondary sulfates are significant components of the $PM_{2.5}$ load in Sydney.' (#53 Greenpeace)

'The Cost Benefit Analysis … overstates the costs of improving ambient air quality. For example, [the report] claims that the cost of installing pollution controls into power station to reduce SO_2 emissions is $1090 per kilowatt, whilst the United States Energy Information Agency suggests a price of US$104.88 (approximately AUD$146.99) per kilowatt.' (#4 Environmental Justice Australia).

'The vast majority (~97%) of the costs associated with SO_X abatement are in NSW and Victoria and are associated with installation of wet flue gas de-sulfurisation (FGD) scrubbers at coal fired power stations. The technological costs in the CBA which have been applied on a per kW basis are wrong for two reasons:

- *FGD is only relevant to coal fired power stations and would not be installed in gas fired power stations. These power stations should be removed from the cost calculation.*
- *The 1,200 MW Hazelwood coal fired power station in Victoria has closed and the 2000 MW Liddell coal fire station in NSW is slated for closure in 2022. These should also be removed from the cost calculation.*

This does not include further reductions associated with other power stations slated for closure before 2040 or power stations which are not operating at full capacity. This would reduce the overall costs of FGD installation in NSW and Victoria by 32% or ~$7.8 billion.' (#39 Nature Conservation Council of NSW)

Some submissions expressed concern that the analysis is based on out-of-date information or considered that more recent developments could significantly change the results.

'Much of the analysis [in the MCA] is based on material that predates commercial renewable energy, the Paris Agreement and various state policies on energy and emissions standards.' (#26, Australian Conservation Foundation, quoting The Australia Institute)

Many industry submissions expressed concerns about the cost assumptions made in the CBA. Some also stated they consider the CBA results unsuitable and that further consultation and analysis is required before NEPC introduces new standards.

'The extent to which additional investment will be required to meet the proposed standard; the cost of that investment; and the likelihood that the prospect of those costs would lead to facility closure or reductions in production - have all been underestimated in the cost benefit analysis, based on our estimates within the aluminium industry. Alumina refineries and aluminium smelters in Australia are already on thin or non-existent margins. Global prices are low for both alumina and aluminium, impacting facilities in many countries. Australian facilities are under additional pressure from high energy prices. Any requirement to invest tens of millions of dollars to address increased regulatory hurdles – such as may be the case under the draft variation - may become the trigger for curtailment or closure of a facility.' (#24 Australian Aluminium Council)

'[The] final measures adopted for the Abatement Package scenario were hypothetical and not consulted on with industries. By not validating key inputs, which provides the foundation to the modelling, it seriously undermines the Impact Statement, and hence its outcomes and recommendations to vary the AAQ NEPM.' (#13 Queensland Resources Council)

'The MCA recommends that the National Environment Protection Council (NEPC) undertake targeted consultation with key industries to test and validate the data used to inform the proposed variations.' (#43 Minerals Council of Australia)

'The CBA…has not been subject to wide stakeholder consultation, including industry technical and policy input. Therefore, its use as a basis to define Abatement measures is questionable. Mobil considers further work is required to determine what specific abatement scenarios are achievable with a sound cost/benefit.' (#20 Mobil)

'Recognising that State Governments are responsible for making plans to meet these proposed new AAQ NEPM Standards, the cost-benefit modelling conducted to date must be recognised as unsuitable for use, or appropriation by individual jurisdictions……. Caltex expects that state jurisdictions will conduct a more thorough cost benefit analysis, in consultation with industry, when developing a response to these new standards.' (#29 Caltex)

Response

NEPC notes the range of views regarding the technical components of the review.

NEPC wishes to emphasise that the recommendations formed through the review are based on a weight-of-evidence approach that considered numerous factors. The CBA constitutes just one consideration (which is a requirement under the *NEPC Act 1994*).

Monitoring data from AAQ NEPM monitoring stations around Australia were considered in the review. AAQ NEPM stations are intended to provide a measure of generally representative ambient air that the population is exposed to. However, NEPM stations may be affected by major emission sources (such as industry, vehicles or shipping).

NEPC notes concerns that only airsheds in major cities in NSW and VIC were modelled and that inventory data used was dated. To assist future air quality assessment in all Australian cities, the Impact Statement recommends air dispersion modelling capability for all jurisdictions through the development of detailed and nationally consistent emission inventories. This would enable an understanding of pollutant formation and the identification of cost-effective abatement measures for each jurisdiction.

NEPC notes additional studies mentioned in several submissions, including the Expert Position Statement. Some of these studies:

1) Were considered in the selection of CRFs in the preliminary work undertaken by Australian epidemiologists in 2012 (Jalaludin and Cowie, 2012[19]), however they may not have been recommended. The WHO Regional Office for Europe also developed more recent CRFs that were used in this study (WHO, 2013)[20]

2) Demonstrate changes in biomarkers (such as raised interleukin levels) rather than health outcomes in themselves. Whilst this improves our understanding of biological pathways, the preference is to include studies that provide clear health outcomes, such as cardiovascular and respiratory disease

[19] Jalaludin and Cowie, 2012, Health Risk Assessment – Preliminary Work to Identify Concentration-Response Functions for Selected Ambient Air Pollutants

[20] WHO, 2013, Health risks of air pollution in Europe (HRAPIE)

3) Focussed on the health effects of traffic related air pollution (TRAP) – where NO_2 was mostly used as a marker for this type of pollution

4) Were too recent to be included in the analysis

Overall, the studies indicate that there are health effects at levels below the current standards and there will be benefits in reducing exposure to these pollutants.

NEPC's position is that the standards are reviewed again in 2025, given that the health evidence continues to accumulate in Australia and overseas, and that there is no evidence of a threshold for NO_2 and SO_2 below which health effects are not observed. NEPC also notes that often studies use NO_2 as a marker for TRAP, however, it is not clear which pollutant (or mixture) is responsible for some observed health effects. Whilst it is likely that tightening NO_2 standards will reduce levels of other TRAP as well, there remains some uncertainty.

NEPC notes the view that Australian CRFs are preferred over international ones and considers the suggestion to develop a summary CRF (combining Australian and international CRFs) a useful consideration for future reviews. NEPC wishes to emphasise that the methodology aligned as closely as possible to NEPC's (2011) *Methodology for setting air quality standards in Australia* and good practice standard setting (such as that used by the USEPA) and as such:

1) Included both international CRFs and relevant Australian CRFs in the assessment

2) Adopted the roll-back procedure to estimate the health outcomes avoided from meeting a standard option

NEPC agrees the evidence does not identify a threshold below which health effects are not observed for NO_2 and SO_2. The Group 1 and 2 CRF's differ in the application of a cut-off to account for the uncertainty in the effect of long-term exposure to NO_2 and short-term exposure to O_3 below a certain concentration. This is described in the HRA along with the reasons to exclude the cut-off in Group 2. The HRA also explains that the cut-off should not be considered a 'threshold for effect' but a reflection of the uncertainty.

NEPC notes stakeholder concerns about the CBA. The CBA assessed the costs and benefits of a hypothetical abatement package to lower NO_2, SO_2 and O_3 concentrations compared with BAU. It did not assess the costs of meeting the proposed standards. This was due to:

1) The resource requirement to iteratively model air quality to meet all possible standards

2) The possibility for unintended increases in some pollutants arising from some of the abatement measures, e.g. measures to reduce NO_2 potentially leading to increases in O_3 concentrations (as the relationship is not linear)

3) The fact that in many cases the range of alternate standards could be met without abatement

The NEPM establishes a nationally consistent ambient air quality monitoring and reporting framework and is not intended to compel pollution control technology. The abatement package considered in this review was one hypothetical package of national measures to reduce NO_2, SO_2 and O_3 concentrations and selection of the package was based on a valid process, however, there are other measures that could be adopted to achieve this. Furthermore, more detailed analysis and consultation would be required as part of the appropriate regulatory decision-making process prior to adopting individual measures.

NEPC also notes that there is a broad range of policies that could reduce air pollution while also having other environmental, health, social or economic benefits, such as reducing greenhouse gas emissions.

Regarding the CBA's cost assumptions, the CBA sensitivity analysis tested cost assumptions such as higher and lower abatement costs (+/- 50% of central costs). NEPC considers that this range of sensitivity should account for variation in cost assumptions, and other events, such as early industry closures.

In relation to application of abatement measures for power stations, NEPC advises that:

- The abatement costs used in the analysis accounted for Australian conditions
- Power stations closed prior to the analysis commencing were not included
- Power stations with known closure dates were removed from the analysis post-closure date

NEPC also confirms that the analysis has correctly applied technologies to natural gas and coal-fired power plants.

It is not within the scope of this review to assess the costs and benefits of how states apply the AAQ NEPM standards as point source targets. Jurisdictions should assess the costs and benefits of how they apply the AAQ NEPM standards in accordance with their own regulatory processes.

The CBA quantified the main health effects from the three pollutants (including premature mortality) and the co-benefit of reducing $PM_{2.5}$ for relevant abatement measures. It also qualitatively discussed its limitations, including that a number of other health benefits were unable to be quantified. The CBA did however, acknowledge the potential benefit of reducing secondary particles through measures to reduce NO_2 and SO_2, while noting the inherent uncertainty which prevented its inclusion. NEPC also notes work done in parts of NSW to understand the contribution of secondary particles but notes that this cannot be applied to other parts of NSW or Australia for the purposes of standard setting.

The recommendations formed through the review are based on a weight-of-evidence approach that considered numerous factors. The CBA constitutes just one consideration (which is a requirement under the *NEPC Act 1994*).

Issue 15 Community involvement in standard setting

Impact Statement position

The Impact Statement and draft variation of the AAQ NEPM do not propose changes to community involvement in standard setting.

Submissions

Some community submitters called for greater community involvement in the standard setting process.

> *'As we have previously expressed to the NEPC, community members and groups have up to this point been ignored in the policy process for development, implementing and reviewing air pollution standards… It is absolutely inadequate that civil society is consulted once the Impact Statement has been completed and proposed standards have been chosen. The NEPM variation process must be redesigned to be open and transparent during the*

development stage of proposed variations, not after… A protocol for community involvement should be negotiated and adopted, along the lines of the protocol that guided community involvement in the initial development of the NEPMs for Ambient Air and the National Pollutant Inventory.' (#4 Environmental Justice Australia, #51 Bioenergy Australia)

'Adopt an improved protocol for community involvement in the development, implementation and review of air pollution standards.' (#38 Maules Creek Country Women's Association of NSW, #150 Yasmine Fauzee)

Some industry submissions expressed concerns regarding the lack of engagement with industry through this review process, particularly related to the cost assumptions and measures already being adopted by some industries to lower emissions that weren't factored into the BAU or CBA. This is described in more detail in Issue 14.

Response

NEPC notes comments on this issue.

The *NEPC Act 1994* includes provision for public consultation (section 18) when NEPMs are made or varied, and a requirement (section 19) that in making or varying a NEPM, the Council is to have regard to any submissions it receives that relate to the Measure or to the Impact Statement.

Public consultation for this review lasted for a total of 11 weeks between 23 May to 7 August 2019 (although some late submissions were received on 14 August). Approximately 450 unique submissions were received (with over 18,100 in total) responding to issues raised in the draft varied measure and Impact Statement. Approximately 90% of these submissions were made by community groups or individuals.

NEPC considers that future AAQ NEPM reviews could be enhanced to include more public involvement in the standard setting process, e.g. through the release of a discussion paper to gather early public feedback.

Issue 16 Introduction of enforceable standards and national legislation

Impact Statement position

The AAQ NEPM allows for a nationally consistent framework for the setting and implementation of air quality standards and goals, and for the monitoring and reporting of air quality against those standards and goals.

The Impact Statement indicates that setting standards via Commonwealth legislation would depart from the current cooperative approach between jurisdictions in addressing air quality issues. It also highlights that jurisdictions have the requisite local knowledge for assessing regional requirements, leading to the responsibility for air quality management.

Submissions

Submissions show there is support for enforceable standards that include compliance or enforcement mechanisms and/or national legislation.

'A strong and proactive approach to air pollution prevention requires robust and well-resourced institutional arrangements capable of decisive policy intervention. National air pollution regulation must include compliance obligations and enforcement mechanisms, including penalties that create a sufficient deterrent to prevent non-compliance. A good example of this comes from the USEPA and the US Clean Air Act 1970, where US states that fail to ensure compliance with national standards are subject to federal intervention – including orders to comply, issuing penalties, and taking legal action – to ensure compliance.' (#4 Environmental Justice Australia)

'The Commonwealth Government should take responsibility for achieving clean air across Australia by implementing an enforceable national scheme for air pollution that the States and Territories must comply with. The Commonwealth should be responsible for standard setting to ensure communities across Australia have the same strong level of protection. The States should have responsibility for on-ground implementation of air pollution laws and be required to implement the national laws in each jurisdiction in a way that works best in that jurisdiction, provided they are meeting national standards and requirements.' (#4 Environmental Justice Australia)

'We further recommend that the government considers introducing national legislation focused on regulating air emissions consistently across Australia with mandatory standards provided which can only be improved upon by state and territory regulation.' (#33 Environmental Defender's Office of Australia)

'…the lack of any ability by NEPC to require compliance with these standards points to the urgent need for national legislation to protect air to ensure that this purpose is fulfilled.' (#53 Greenpeace of Australia)

'[We recommend something akin to the] US Clean Air Act, where States that fail to ensure compliance with national standards are subject to significant and escalating penalties that compel regulators to implement effective pollution control. This is critical to provide affected members of the community a recourse for action when adversely affected by air pollution.' (#6 Maribyrnong Truck Action Group)

'A national set of laws should be established that enables the control of air pollution under a national regulatory body that is tasked both with monitoring and enforcing compliance. The Commonwealth Government should take on the responsibility for achieving clean air across Australia by implementing a national scheme for air pollution that the States and Territories are all willing to comply with. Thereafter, the Commonwealth should be responsible for standard setting that ensures the same strong level of protection in all communities across Australia.' (#220 Greg Smith)

'Air quality standards should encompass accountability beyond reporting and include compliance obligations and enforcement mechanisms. Under the NEPC Act, accountability for meeting the standards lies in the public reporting; there are no penalties associated with non-compliance... A strong and proactive approach to air pollution prevention requires robust and well-resourced institutional arrangements capable of decisive policy intervention. This includes incentives and penalties that create sufficient deterrence to prevent non-compliance. This is a critical measure to ensure appropriate governance and protections for the community, as well as a pathway for recourse for action when non-compliant activities

cause adverse health outcomes.' (#2 Australian Nursing and Midwifery Federation, Victorian Branch)

'Compliance and enforcement mechanisms need to be a part of Air Quality standards. Institutions responsible should be well resourced and there should be incentives and penalties that create an environment which prevents non-compliance' (#8 NSW Nurses and Midwives Association)

'…the Council needs to commit to ongoing research into and reassessment of our clean air standards, and the application of penalties which are deterrent enough to ensure compliance.' (#151 Florence Thomson)

Response

NEPC notes submissions recommending the introduction of a framework under the AAQ NEPM that involves penalties for non-compliance and/or national legislation. These issues are beyond the scope of this variation. Penalties or sanctions related to non-attainment of standards are not part of the AAQ NEPM framework.

The current framework of state and territory-based arrangements to address local air quality issues also enables management of air quality to be tailored to local and regional needs, while the National Clean Air Agreement provides a framework for national coordination of priority air quality issues.

Issue 17 AAQ NEPM reporting and public access to monitoring data

Impact Statement position

Jurisdictions must submit an annual report to NEPC on the implementation and effectiveness of the AAQ NEPM.

Clause 18 of the AAQ NEPM establishes the reporting requirements for annual performance reports. These include performance assessment at each monitoring station against the AAQ NEPM standards and goals, an analysis of the extent to which the standards are met, a statement of the progress made towards achieving the goal, and a description of the circumstances that led to any exceedances of the standards, including the influence of natural events and fire management.

The Impact Statement proposed a small change to the NEPM reporting protocol, through a revised template to optimise the presentation of information and through guidance that outlines how jurisdictions report on measurement uncertainty.

The Impact Statement also proposed to commence annual reporting of population exposure to NO_2 and O_3, consistent with the approach taken for $PM_{2.5}$. Jurisdictions should agree on any procedures or methods in the assessment and reporting of population exposure to ensure consistency.

No other changes to the NEPM reporting protocol, including the timing and availability of data, were proposed.

Submissions

Submissions showed support for the proposal to annually report population exposure for NO_2 and O_3. Some stakeholders indicated their views that population exposure reporting should also be extended to SO_2 or the method by which population exposure should be reported.

'We support R16… and R24 [that jurisdictions annually report population exposure to NO_2 and O_3]… but we recommend that jurisdictions should commence annual reporting of SO_2 exposure in problem airsheds immediately. This is the best way to identify problems and make improvements (#137 Beeliar Group)

'Reporting of population exposure should be in two forms:

1) *The proportion of the population living in local government areas that exceed the standard.*
2) *A population weighted average exposure value.*

The first of these is most easily understood by the general public. The second reflects the fact that even reductions below the standard are beneficial, so will be of greater value to clean air professionals.' (#27 Public Health Association of Australia)

Many submissions focussed on information delivery and availability and requested the need for a new platform to provide the community with monitoring information beyond what is currently in place through jurisdictions.

'People have a right to know what they are breathing. All air pollution monitoring data must be made publicly available to community members in all states and territories through a coordinated national website, allowing access to real-time and historical data… As a model for this we recommend the NSW Office of Environment and Heritage (OEH) Air website, which provides searchable and downloadable air pollution data' (#4 Environmental Justice Australia)

'Make air quality monitoring data publicly available through a coordinated national website allowing access to real-time and historical data. This should include health alerts for the general public and at-risk population sub-groups e.g. those living or working close to major point sources, such as coal-fired power stations and major roadways.' (#36 Climate and Health Alliance)

'What we are breathing in and what is being emitted to the air in Australia is a matter of public interest. We strongly recommend that real-time and historical air pollution monitoring data must be made publicly available to community members in all states and territories. This could be done through a coordinated national website.' (#33 Environmental Defenders Office of Australia)

'Air quality monitoring data should be made publicly available through a coordinated national website, allowing access to real-time and historical data. This should include: records from daily monitoring of key pollutants, health alerts for the general public and at-risk population sub-groups, and regular modelling of dispersal from all major point sources, such as coal-fired power stations and major roadways. This is critical to provide individuals and communities with information about the quality of the air they are breathing.' (#2 Australian Nurses and Midwifery Federation, Victorian Branch)

'Public awareness is very important when it comes to safety issues, therefore particular attention should be given to the development of user-friendly databases to augment community knowledge about air pollution in their region.' (#51 Bioenergy Australia)

'Most of the population lives nowhere near an air pollution monitor - for example, there are no monitors in the City of Sydney local government area. In some states, communities have to resort to freedom of information requests to access monitoring data.' (#227 Carol Baker)

Response

The AAQ NEPM provides a reporting framework that assesses ambient air quality within jurisdictions and provides this information to the public through annual reporting. NEPC considers the review's proposed changes to the reporting protocol provide a useful enhancement that will improve the display and comprehension of information by the public.

Estimates of the spatial variation in exposure are increasingly recognised as being important for the understanding of population risk. Given the ubiquitous nature of NO_2 and O_3, and the well-established chronic effects of exposure to the two pollutants, **NEPC views the commencement of annual population exposure reporting for NO_2 and O_3 to be a useful metric for jurisdictions to assess population risk**.

Given the localised nature of SO_2 dispersion and that SO_2 exposure across whole populations is low, NEPC considers that annual population exposure reporting would not provide the most meaningful information on population risk. Rather, increased AAQ NEPM monitoring to understand exposure to vulnerable populations that are at risk of being harmed by air pollution (as per the proposed changes to clause 14 of the NEPM), could provide a more useful indication of the health risk to those most exposed.

Similar to the approach taken for $PM_{2.5}$, NEPC's position is that, to inform exposure reduction approaches, jurisdictions collaborate on the development of a national approach to assessing and reporting population exposure to air pollution via NATAG. This could include various methods of population exposure reporting, pending agreement by jurisdictions.

NEPC notes public interest for a new platform through which a variety of ambient air quality information can be provided to the public but considers that this is out of scope of this current variation.

Issue 18 New tools and research to inform future standards

Impact Statement position

The Impact Statement makes recommendations for new tools and future research to establish the evidence base to set air quality standards in the future.

- For a review of the 8-hour O_3 standard once there is a better understanding of O_3 generation in capital city airsheds.
- To keep a watching brief on the growing evidence on the long-term effects of O_3 on health and standards adopted internationally.
- To keep a watching brief on the association between exposure to SO_2 and low birth weights.
- To develop a nationally consistent emissions inventory which will enhance the understanding of emission sources and levels and projection capability in each jurisdiction.

The Impact Statement also references *Projects 5 (Precursors and Emerging Pollutants) and Project 6 (Particles and Health Research)* led by the former interjurisdictional Expert Working Group but does not include further detail as these projects do not immediately lead to changes to the NEPM.

Submissions

Some stakeholders highlighted the need for more research to inform standard setting in the future.

> *'…it is clear further research is required to adequately quantify the health impacts of air pollution and the benefits accruing from controlling air pollution… Additional research should include the utilisation of detailed atmospheric modelling to estimate ground level air pollution across all populated areas of Australia. It is also important to quantify other non-health indicators such as reduced labour productivity, the co-benefits of reducing other pollutants, and reduction in secondary particulate formation. The USEPA included an assessment of many of these factors in its assessment of the costs and benefits of the Clean Air Act.' (#4 Environmental Justice Australia)*
>
> *'We strongly encourage investment in more research to assist in developing understanding around health impacts of air pollutants and continual improvement of standards to protect health of humans and other species. This research could include better understanding of impacts of air emissions near busy roads. We also recommend that research be undertaken into the impacts around major emissions sites on the surrounding environment. Current air emissions regulation is focused on ensuring that emissions are low for surrounding humans with little to no regard for other species that inhabit areas adjacent areas.'*
> *(#33 Environmental Defenders' Office of Australia)*
>
> *'We recommend that the Council should commit to relevant and timely research to keep up with the science on health impacts and the development of a review schedule to update the system.' (#39 Nature Conservation Council of NSW)*
>
> *'[Doctors for the Environment Australia recommend] … each jurisdiction must establish some roadside monitoring sites on roads with more than 20,000 vehicles per day, at locations where people live or work…[and] that a program of research be developed to establish, by 2025, air quality standards applicable to locations where people are exposed near busy roads.' (#1 Doctors for the Environment Australia)*
>
> *'Due to the lack of information regarding a number of health and non-health indicators, further research will need to be conducted to revise the NEPM Impact Statement.'*
> *(#51 Bioenergy Australia)*
>
> *'…the Council needs to commit to ongoing research into and reassessment of our clean air standards…' (#151 Florence Thomson)*

Response

NEPC notes the importance of continued research to ensure that air quality standards are set in the context of the most recent health evidence[21] and notes work led by the former interjurisdictional

[21] Issue 14 discusses some of the health studies identified by stakeholders for consideration in this review.

Expert Working Group to review critical, policy relevant knowledge gaps required to inform future standard setting[22]. NEPC also notes the establishment of NATAG under the National Clean Air Agreement (NCAA) and that NATAG could be well placed to examine some of the above issues in addition to the development of a nationally consistent emissions inventory.

NEPC reemphasises its commitment for a review of the latest scientific evidence of health impacts in relation to the annual average PM_{10} standards (as outlined in the National Clean Air Agreement Work Plan) and to commence review the following standards in 2025 to ensure the appropriateness of the goals to meet the desired environmental outcome:

- 1-hour and 24-hour SO_2 standards
- 1-hour and annual NO_2 standards
- 8-hour O_3 standard
- 24-hour and annual $PM_{2.5}$ standards

NEPC notes the submissions recommending a roadside monitoring program be established to develop the evidence base for a future roadside air quality standard but considers this is out of scope of the current variation. However, NEPC recognises the value of exploration of a national monitoring program (including consideration of whether NATAG could lead this work) given the clear impact of vehicle emissions along roads and the vast proportion of the population exposed. Importantly, consideration of jurisdictional roadside monitoring programs must be considered to avoid duplication of effort.

Consequently, **NEPC's position is:**

- **For a review of the 8-hour O_3 standard to commence in 2025 once there is a better understanding of O_3 generation in capital city airsheds**
- **To keep a watching brief on the growing evidence on the long-term effects of O_3 on health and standards adopted internationally for consideration in future AAQ NEPM reviews**
- **To keep a watching brief on the association between exposure to SO_2 and low birth weights for consideration in future AAQ NEPM reviews**
- **For NATAG to develop a nationally consistent emissions inventory which will enhance the understanding of emission sources and levels and projection capability in each jurisdiction**
- **For NATAG to explore the development of guidance on near-road monitoring and assessment**

Issue 19 Timing for making and implementing the AAQ NEPM

Impact Statement position

The Impact Statement does not discuss the timing of the varied NEPM. Additionally, the Impact Statement does not propose when jurisdictions will implement the new varied NEPM.

[22] The work relates to Projects 5 and 6 that are referred to in the Impact Statement.

Submissions

Some submissions indicate stakeholders feel the standards should be implemented as soon as possible.

> *"It has been eight years since the NEPC recommended strengthening the desired environmental outcome of the NEPM to focus on minimising risk for all people wherever they may live and more than three years since the Victorian Government initiated the review of standards for these pollutants. The variation must be finalised without delay. The NEPC must adopt this variation as a priority – by the end of 2019." (#4 Environmental Justice Australia)*
>
> *'Australia has fallen behind in updating air quality standards and that means communities, families and individuals pay the price by bearing the burden of preventable health impacts. Armed with the knowledge that there is no truly safe threshold for air pollution, it is incumbent upon this process to ensure safe standards are not delayed until a future date.' (#26 Australia Conservation Foundation)*
>
> *"We need improvements as soon as possible and state regulators must ensure compliance from the commencement of the NEPM in 2020." (#6 Maribyrnong Truck Action Group)*
>
> *"All State, Territory and Commonwealth Governments must ensure the National Environment Protection Council (Australia's 9 environment ministers) adopt the new standards as a priority – by the end of 2019." (#38 Maules Creek Country Women's Association of NSW)*

Conversely, many industry stakeholders indicated a preference to delay the variation in order to allow for more detailed consultation.

> *"Current, and further recommended, consultation with stakeholders should be used to inform further investigation and assessment of impacts and opportunities across industries and jurisdictions. In this respect, the NEPC should delay any proposed variation to the AAQ NEPM until such works are complete and the outcomes published." (#13 Queensland Resources Council)*
>
> *'…the Australian Aluminium Council does not support the proposed variation to the AAQ NEPM as currently formulated. We encourage the NEPC to revise the proposal, and the accompanying justifications, with particular attention to the following issues:*
>
> - *the Abatement Package scenario should be revised to include measures that address emission from sectors outside industry including fuels and transport;*
> - *the cost benefit analysis should be reassessed after consultation with impacted industry to better understand likely costs, impacts and alternatives;*
> - *the recommendations for quantitative standards should retain the ability for occasional exceedances; and*
> - *where standards for levels of emissions are to be reduced, sufficient time should be allowed for industry compliance to enable investment in required capital in a way that reduces any threat to ongoing viability of facilities.' (#24 Australian Aluminium Council)*
>
> *'In principle, setting the air quality standards on the basis of achievability is appropriate, especially when a rule for reporting exceptional events is being recommended. However, the*

practical application of achievability has not been defined in the variation and Mobil considers further work is required to determine whether the proposals are actually achievable… Mobil considers that the impact on industry could be broader than impacts on licence conditions, including a potential suite of policy measures driven by the proposed changes to the AAQ NEPM which have not been assessed by the impact statement. Mobil considers that further work is required to understand the costs of abatement measures before any further actions are taken to alter the standards for ambient SO_2, NO_2 and O_3 levels.' (#20 Mobil)

Some stakeholders commented on the timing of the introduction of any new NEPM standards into states and territories, including when jurisdictions will apply the standards to industry.

"Given how rarely the NEPM standards are reviewed, agreed increases to standards should be required to be implemented by the states and territories within 6 months. To date there have been significant delays in the implementation of the increases to standards. For example, in 2015 the standards for $PM_{2.5}$ and PM_{10} were strengthened by agreement under the NEPM framework. Only recently in 2019, over 3 years later, the Queensland Government has notified that it intends to update the law enshrining these standards for Queensland (the Environmental Protection (Air) Policy 2008). This is a significant delay which has meant all communities impacted by new proposals that have been assessed and approved in the meantime have not been protected by the implementation of the agreed improved standards." (#33 Environmental Defenders Office of Australia)

"Presently, the NEPM is baselining human health on a system that was designed in 1998; this is not aligned to current scientific recommendations. Improvements to the current system should be finalized by the end of 2019 and regulators should ensure polluters comply from 2020 onwards." (#39 Nature Conservation Council of NSW)

"…regulators must ensure compliance with the new standards from the commencement of the NEPM in 2020. In order to evaluate the benefits of the proposed stricter standards and to deal with potential non-compliance issues, periodic reviews should be conducted." (#51 Bioenergy Australia)

"So long as the current practice of applying AAQ NEPM's in a manner which is inconsistent with its stated intent has the potential to continue, Origin is concerned with the short timeframes for implementation." (#35 Origin)

"Sufficient time needs to be allowed to enable industry to achieve compliance, similar to the 10-year compliance goal when the AAQ was originally released." (#23 Alcoa Australia)

"…where standards for levels of emissions are to be reduced, sufficient time should be allowed for industry compliance to enable investment in required capital in a way that reduces any threat to ongoing viability of facilities." (#24 Australian Aluminium Council)

Response

NEPC notes stakeholder views relating to timing.

Although revised AAQ NEPM standards would automatically apply to jurisdictions, some jurisdictions (e.g. VIC) must incorporate the revised AAQ NEPM standards into local legislation for them to apply

as state-based standards. NEPC considers that it is beyond the scope of this variation for it to set any timeframes that participating jurisdictions must meet in adopting any revised AAQ NEPM standards.

As discussed under Issue 3, NEPC considers that it is beyond the scope of this variation to dictate how (and when) states and territories apply the AAQ NEPM standards in individual project assessments. This needs to be determined by individual jurisdictions based on their own regulatory decision-making processes. However, some 'guidance' on what the AAQ NEPM is intended for is provided in the explanatory statement.

NEPC notes the views that there should be more consultation with industry before the standards are revised but maintains that there is sufficient rationale to revise the standards now based on the clear health evidence of the harm from exposure to these pollutants.

The issue of compliance and enforcement of the AAQ NEPM (including timing) is discussed in Issue 16.

Issue 20 Frequency of AAQ NEPM reviews

Impact Statement position

The Impact Statement and draft variation of the AAQ NEPM did not propose changes to the review period of the AAQ NEPM. However, the Impact Statement did recommend a future review of the O_3 standards in 2025, with the option of reducing it once there is a better understanding of O_3 generation in city airsheds.

Submissions

A number of submissions suggested the need to shortly review the AAQ NEPM again, including at 5-year or 10-year intervals, to confirm the evidence base and the appropriateness of the recommended standards.

> *'We recommend conducting a national review of the NEPM variation in 2025 to formally assess the merits of shifting to the stricter standards, consistent with an exposure reduction framework, and to respond to instances of non-compliance.' (#4 Environmental Justice Australia)*

> *'NEPC should include provisions for regular standards review, commencing in 2025, to review standards against developments in science and medicine.' (#9 Hunter Environmental Lobby)*

> *'We recommend that a revision of the NEPM standards be required to be undertaken every 5 years at most, to ensure that it is kept up to date with the most recent scientific understanding and technological advancements to best protect health.' (#33 Environmental Defender's Office of Australia)*

> *'We recommend that the Council should commit to relevant and timely research to keep up with the science on health impacts and the development of a review schedule to update the system. The first review of the updated sulfur dioxide, nitrogen dioxide and ozone standards that result from this process should occur in 2025.' (#39 Nature Conservation Council of NSW)*

'Due to the lack of information regarding a number of health and non-health indicators, further research will need to be conducted to revise the NEPM Impact Statement.' (#51 Bioenergy Australia)

'There should be a mandated period of review of the NEPM set at every 10 years to ensure that the standards are in accord with new research on the health effects of air pollution.' (#123 Dr. Richard Yin)

Response

As discussed under each specific pollutant section, **NEPC's updated position is to review the 1-hour and 24-hour SO_2 standards, and the 1-hour and annual NO_2 standards in 2025,** which will enable an opportunity to tighten the standards in line with the available evidence.

NEPC also continues to support a review of the 8-hour O_3 standard in 2025 once there is a better understanding of O_3 generation in city airsheds.

Future reviews of the AAQ NEPM annual PM_{10} standard and $PM_{2.5}$ standards are also planned[23].

Issue 21 Protection of the environment

Impact Statement position

The Impact Statement recognises the impacts of NO_2 on the environment, in particular on crops, vegetation and animals; however, the burden of the pollutant on vegetation, animals and food production is not quantified due to a lack of reliable data.

The Impact Statement notes the AAQ NEPM standards are health based but may also protect vegetation and ecological functions. It also notes that in some jurisdictions, vegetation protection standards in some cases are the same as human health-based standards.

Submissions

Some submissions highlighted the need for stringent standards to protect the environment.

"The national air quality standards should set stricter standards for pristine environments, like, for example, air pollution standards for point sources in remote areas. The inverse argument, promoted by industry, that pollution in remote areas does not matter is wrong, as such regulation will seriously degrade the natural environment. This priority will limit the size of the ecological footprint from pollution sources by protecting the best of the best for degradation." (#25 Colong Foundation for the Wilderness)

Other submissions outlined the need to reduce pollution to protect local food production.

"We also would like to protect our food producing region – land and water: drinking water may be contaminated. These pollutants will also impact our soils leading to permanent

[23] The particles reviews include a review of the $PM_{2.5}$ goals in 2025, and a review of the latest scientific evidence of health impacts in relation to annual average PM_{10} standards as per the National Clean Air Agreement Work Plan 2018-2020 (https://www.environment.gov.au/system/files/resources/382042b2-d9e0-4b1c-aeaa-a4bcb93f71ff/files/national-clean-air-agreement-work-plan.pdf).

degradation of the soil and this of course affects the food grown and people here and those who buy the food – will eat." (#38 Maules Creek Country Women's Association of NSW)

Response

Setting separate standards to protect the environment in general (or particular aspects of it such as animals, vegetation or crops) is not proposed through this review as the AAQ NEPM standards are human health-based standards. It is noted that improvements to the standards as proposed through this review may also extend protection to the environment.

Issue 22 Specific emission sources

Impact Statement position

The Impact Statement considered jurisdictions' emissions inventories. The Impact Statement and draft variation of the AAQ NEPM do not propose amendments to the AAQ NEPM based on specific emission sources. It also recommends consideration should be given to investigating additional abatement measures that address motor vehicle emissions and broader transport options, given the significant contribution to NO_2 levels in Australian cities from these sources.

Submissions

Many submissions commented on specific emission sources. This includes from sources currently managed by jurisdictions (for example certain industry and planning) and those managed nationally (for example vehicle emissions).

In particular, submissions indicated that many stakeholders support standards that they believe would drive the uptake of emission control technology or best practice air quality management practices.

Emissions from coal fired power stations

"Power station pollution can be reduced by post combustion treatment of flue gases, and of course wind and solar based electricity avoid air pollution completely. These are all simple steps that will help Australia meet ambitious clean air objectives set by revised NEPM standards." (#70 Chrisy Richardson)

"The two main sources of SO_2 and NO_2 are vehicle emissions and coal-fired power stations. The technologies to reduce air pollution from coal-fired power stations and vehicles are readily available and already in place in many countries. I lived in the Hunter Valley for many years, and asthma was a prominent problem, with 30,000 children going to school in the railway corridor where every 8 minutes trains carrying tonnes of coal in uncovered wagons spewed out fine particle pollution every day." (#117 Catalina Sturmberg)

"Replacement of coal-fired power stations with renewable energy would also remove other toxic emissions, such as particle pollution, which caused a significant health burden on the community." (#39 Nature Conservation Council of NSW)

"Everyone has a right to clean air. Air pollution can be toxic and pollution from Australia's out-dated coal-fired power station technology has been shown to be a serious problem for

some communities. So is air pollution from the mining, processing and transport of coal." (#98 Kevin McDonnell)

"We need to strengthen our air pollution standards to at least match those advised by the World health organisation. If we are to continue with coal burning power stations we need to at least improve our filtration units of these plants to bring them up to the best in the world. Coal-fired stations could reduce their emissions of these two pollutants (Sulfur dioxide and nitrogen oxides) by 85% or more by installing readily available pollution controls. But they won't do this unless required." (#100 Kathy Donnelly)

"This NSW air pollution disease burden is quite inappropriate when we know that governments can control power stations and they can order power stations to place devices on these stations to reduce the high level of toxic gas emissions." (#173 Janet Roden)

Vehicle emissions and planning

"Exposure to vehicle pollution to be reduced by significantly stronger vehicle emissions standards, by situating schools and child care at a distance from busy roads, by improved accessibility to public transport, by reducing the use of diesel fuel, and by schemes and infrastructure to support the use of electric vehicles." (#121 Kate Charlesworth)

"One priority should be that all vehicles, old and new on the road need to meet mandatory standards for tailpipe emissions, as is practiced in Europe and elsewhere. It should not be left up to individual discretion to service their cars and cars that do not meet standards should be removed from the road. Old, smoky, poisonous vehicles should not be allowed to drive past me and ruin my air and degrade the air of those who live near motorways. Exhaust standards for new vehicles should be world best practice so more polluting vehicles are not 'dumped' on our markets." (#164 Arwen Birch)

"The two main sources of these gasses are vehicle emissions and coal-fired power stations. The technologies to reduce air pollution from coal-fired power stations and vehicles are readily available and already in place in many countries - and strict standards limiting air pollution would help speed the transition to clean renewable energy and electric vehicles will help reduce their total emissions." (#66 Bryan Walpole)

"More clean public transport options, smart urban planning of transportation infrastructure and investment to incentivise public transport usage will all assist in reducing vehicle emissions, while also increasing wellbeing of citizens in their commutes." (#33 Environmental Defenders Office of Australia)

"I live near Fremantle Port so I am hit in the face with many thousands of cars being unloaded onto the dock each week. The bulk of the vehicles are large and very large truck size supposedly family cars that pump out way more pollution and use up so many more resources than small cars. This makes me sick in the gut to think this is our answer and contribution to help with reducing global abuse of our planet." (#152 Yvonne Excell)

Shipping emissions

"NO_2, along with PM_{10} and $PM_{2.5}$ particulates, emanating from diesel trucks using the local roads in the Inner West and ships in Port Phillip Bay spewing these noxious and carcinogenic

fumes into the Inner West air shed, is impacting on the health of the Inner West community of Melbourne." (#115 Geoffrey Mitchelmore)

'I have lived in Hemmant for 38 years, and in that time, the container port has grown outwards on land reclaimed from the bay to accommodate more than 2400 hundred ship movements a year. Also under development is a large cruise ship terminal… We need the emission standards to be reviewed to protect us all.' (#373 Mary Slivka)

'The Port of Brisbane has grown in the last 30 years and expanded outwards on land reclaimed from the bay to accommodate many thousands of ship movements a year… any residents do not realise the impact of living close to the river and bay includes a pollution cost, which is especially borne by young children and older people with compromised health… we need emission standards to be reviewed to protect us all.' (#295 Clean Air Wynnum)

Response

The AAQ NEPM sets a nationally consistent monitoring, assessment and reporting framework for jurisdictions. It does not compel or direct pollution control measures. Although NEPC recognises that AAQ NEPM standards may drive policy approaches, it is not proposed that the AAQ NEPM prescribe or regulate pollution control measures.

Some of the emission sources of concern are directly regulated by states and territories and therefore, pollution reductions measures are assessed by individual jurisdictions. Some proposed measures are assessed through national assessment processes.

While these issues are not within the scope of this review, NEPC notes the recommendation in the Impact Statement that consideration be given to investigating additional abatement measures that address motor vehicle emissions and broader transport options, given the significant contribution to NO_2 levels in Australian cities from these sources.

NEPC however, notes that the introduction of any measure would require consideration under normal regulatory processes at the jurisdiction or national level.

Issue 23 Other pollutants

Impact Statement position

This AAQ NEPM review focusses on the three pollutants: O_3, NO_2 and SO_2. This review follows the completion of the particle (PM_{10} and $PM_{2.5}$) standards in the AAQ NEPM, which resulted in the variation of the AAQ NEPM particle standards in 2015.

The proposed variation to the AAQ NEPM does not propose any changes to any other standard (PM_{10}, $PM_{2.5}$, CO, or Pb) but note that it proposes to remove the allowable exceedances rule for CO.

Some changes in this review could impact the way other pollutants are measured under the AAQ NEPM framework, e.g. the changes to clause 14 (discussed in Issue 2) could lead to monitoring of other pollutants in regions or sub-regions with vulnerable populations that are at risk of being harmed by air pollution.

Submissions

One submission requested retention of allowable exceedances for CO on the basis that the costs and benefits have not been suitably assessed in the Impact Statement.

> *'The complete removal of allowable exceedances is not supported. The Impact Statement did not include an assessment of the potential ramifications of such a change (pp 21) and proposes to do so only on the basis of aligning with recommendations for O_3, NO_2 and SO_2. Australia's current approach of applying an allowable exceedance of 1 day per year is already amongst the strictest in the world across numerous AAQ NEPM standards. This recognises the impracticalities and costs (to both Government, industry and the community) of acting on a single exceedance. The allowable exceedance of 1 day per year should be retained.' (#31 Cement Industry Federation)*

Some submissions expressed concern regarding exposure to other pollutants not covered in this review and called for actions to improve monitoring or to reduce them.

> *'I [have] live[d] in the lower Hunter since 1985, and the coating of black from the explosion of coal dust of rapidly growing open cut coal operations, since 2000, and uncovered trains, and the toxicity of the coal fired power stations, is "breathtaking".' (#107 Graeme Tychsen)*

> *'I realise the parameters of the review are limited to specific substances, but I would like to say it needs to be extended further. As a child I was poisoned by mercury and it has had an ongoing impact on my health. Mercury especially impacts on young children, so it should not be released into the air we breathe.' (#146 Kay Shields)*

> *'…the Maules Creek environment in which our members call home, is a place that has suffered from the introduction of coal mining air pollution. This has escalated recently as mining has increased production, and over summer winds are picking up dust from the white heaps and circulating it. Overnight, it seems that more dust is created. The wind is swirling the increasingly dry, dusty mine surfaces into our valley... The network of NEPM compliance monitors should be expanded to reflect particular risks from widespread coal mining. Due to three mines we would need cameras and weather stations on each to determine who is the polluter at the time' (#38 Maules Creek Country Women's Association of NSW)*

> *'I lived in the Hunter Valley for many years, and asthma was a prominent problem, with 30,000 children going to school in the railway corridor where every 8 minutes trains carrying tonnes of coal in uncovered wagons spewed out fine particle pollution every day.' (#117 Catrina Sturmberg)*

> *'…air quality and air pollution standards have been an ongoing concern for a number of our districts, especially during winter, when the level of particle pollution is increased due to the use of wood-fired heaters.' (#37 Central West Environment Council)*

> *'The burning of Mountain ash logging coupes is not monitored and not considered an industrial emission. This must stop. All logging coupe burning should cease and regeneration should be achieved through other means. The burning is not necessary it is just financially expedient. Not only does it cause severe air pollution, there are many cases of the burns "getting away" and causing other forest fires that add significantly to air pollution.' (#131 Linda Bradburn)*

Response

The AAQ NEPM sets a nationally consistent ambient air quality monitoring framework for six pollutants: CO, Pb, PM (as PM_{10} and $PM_{2.5}$), O_3, NO_2 and SO_2. The AAQ NEPM targets the major pollutants within the general mass of air in the major airsheds to which the majority of Australia's population is exposed. Consequently, other substances such as mercury are not included.

NEPC's position is for removal of the allowable exceedances for the CO standards. NEPC considers the impact of its removal to be negligible given recent low levels of CO across all jurisdictions (that are well below the CO standard of 9 ppm) which makes the allowable exceedance rule redundant. Retaining the allowable exceedance rule for CO would be inconsistent with the available evidence.

NEPC completed the review of AAQ NEPM particle standards in 2014 and varied the particle standards in 2015 to:

- Amend the status of the annual average and 24-hour average $PM_{2.5}$ 'advisory reporting standards' to 'standards'
- Include an annual average PM_{10} standard of 25 $\mu g/m^3$
- Include an aim to move to annual average and 24-hour $PM_{2.5}$ standards of 7 $\mu g/m^3$ and 20 $\mu g/m^3$ by 2025
- Initiate a nationally consistent approach to reporting population exposure to $PM_{2.5}$
- Replace the five-day exceedance form of the 24-hour $PM_{2.5}$ and PM_{10} standards with an exceptional event rule

NEPC does not propose any changes to the particle standards or any specific emission controls through this review.

Environment ministers agreed that a review of the latest scientific evidence of health impacts in relation to annual average PM_{10} reporting standards, co-led by VIC and NSW, will be undertaken[24].

[24] Agreed Statement, Fourth Meeting of Environment Ministers, 15 December 2015. Available at: www.environment.gov.au/about-us/mem.

Attachment 1

NEPC's positions following public consultation.

Number	NEPC Positions
Desired environmental goal and outcome	
1	The desired environmental outcome of the AAQ NEPM should be revised to 'ambient air quality that minimises the risk of adverse health impacts from exposure to air pollution.
2	The goal of the AAQ NEPM should be revised to make reference to the air quality standards and incorporation of exposure-reduction targets for priority pollutants.
Sulfur dioxide	
3	The status quo should be maintained of not including a 10-minute SO_2 standard in the AAQ NEPM.
4	The 1-hour standard for SO_2 in the AAQ NEPM should be retained, and the numerical value of the standard should be reduced to 100 ppb.
5	A future 1-hour SO_2 standard of 75 ppb should be introduced into the AAQ NEPM in 2025.
6	A review of the 1-hour SO_2 standard should commence in 2025, with the intention of tightening the standard in line with available evidence.
7	The 24-hour standard for SO_2 in the AAQ NEPM should be retained, and the numerical value of the standard should be reduced to 20 ppb.
8	A review of the 24-hour SO_2 standard should commence in 2025, with the intention of tightening the standard in line with available evidence.
9	The current annual mean standard for SO_2 should be removed from the AAQ NEPM.
10	The form of both the 1-hour and 24-hour SO_2 standards should be the maximum value with no allowable exceedances.
Nitrogen dioxide	
11	The 1-hour standard for NO_2 in the AAQ NEPM should be retained, and the numerical value of the standard should be reduced to 80 ppb.
12	The annual standard for NO_2 in the AAQ NEPM should be retained, and the numerical value of the standard should be reduced to 15 ppb.
13	The form of both the 1-hour and annual NO_2 standards should be the maximum value with no allowable exceedances.
14	A review of the 1-hour and annual NO_2 standards should commence in 2025, with the intention of tightening the standards in line with available evidence.
15	Jurisdictions should also commence annual reporting on population exposure to NO_2 from the commencement of a varied AAQ NEPM.
Ozone	
16	The current 1-hour and 4-hour standards for O_3 should be removed from the AAQ NEPM.
17	Jurisdictions should continue to record and report 1-hour O_3 concentrations.
18	A rolling 8-hour standard for O_3 in the AAQ NEPM should be introduced, and the numerical

Number	NEPC Positions
	value of the standard should be 65 ppb.
19	The 8-hour standard should be reviewed in 2025, with the option of reducing it once there is a better understanding of O_3 generation in capital city airsheds.
20	The form of the 8-hour standard for O_3 should be the maximum value with no allowable exceedances (excluding exceptional events).
21	An exceptional event rule should be implemented for O_3, defined in a way that is consistent with the approach for PM_{10} and $PM_{2.5}$ in the AAQ NEPM.
22	An exposure-reduction framework, in the form of a long-term goal for O_3, should be considered to reduce population exposure and associated health risk once there is a better understanding of O_3 generation in capital city airsheds.
23	Jurisdictions should commence annual reporting on population exposure to O_3 from the commencement of a varied AAQ NEPM.

Other NEPC positions:

- To assist in the assessment of air quality in the future in all Australian cities, detailed and nationally consistent emission inventories need to be developed to enable air dispersion modelling for all jurisdictions. This will enable cost-effective abatement measures to be identified for each jurisdiction based on an understanding of pollutant formation in that jurisdiction.
- A 1-hour O_3 community health information value or alternative forecast mechanism should be used by states and territories to provide quick community health alerts in conjunction with an 8-hour standard.
- Given the growing evidence on the long-term effects of O_3 on health, it is recommended that a watching brief be kept on key research and trends in international standards in this area for consideration in future AAQ NEPM reviews, with a view to potentially adopting a long-term goal as part of an exposure-reduction framework, in the future.
- A watching brief should be kept on the association between SO_2 and low birth weights for consideration in future AAQ NEPM reviews.
- Consideration should be given to investigating additional abatement measures that address motor vehicle emissions and broader transport options, given the significant contribution to NO_2 levels in Australian cities from these sources.
- Clause 14 in the AAQ NEPM (Number of performance monitoring stations) should be amended to introduce a primary focus on risk as determined by jurisdictions.
- The allowable exceedances rule should be removed for CO for consistency with the other pollutants in the AAQ NEPM and based on the recent historical and likely concentrations of CO in the future.
- NATAG should explore the development of guidance on near-road monitoring and assessment.