

## **Report on the Preliminary Work for the Review of the Ozone Standard**

### **Summary of process**

In making the National Environment Protection (Ambient Air Quality) Measure (the NEPM) in 1998, the National Environment Protection Council (NEPC) adopted:

- o a one-hour ozone standard of 0.10 parts per million (ppm); and
- o a four-hour ozone standard of 0.08ppm.

It also agreed to a range of future actions including:

- o by 2003 commence a review of the practicability of setting a long-term goal (more than 10 years) of achieving a one-hour average standard for ozone of 0.08ppm within the major urban airsheds; and
- o commence a review of the Ambient Air Quality NEPM in 2005.

In October 2003, EPHC agreed that the practicability of tightening the one-hour ozone standard should be considered as part of the review of the NEPM as a whole (now underway), but that preliminary work would commence in advance. This work would focus on which averaging periods would be most appropriate for ozone standards for the protection of the health of the Australian population.

The major impetus for this work was the findings of the 2003 Woolcock Institute review of the health impacts of ozone indicating that, internationally, governments are implementing ozone standards with eight-hour averaging periods (on the basis that extended exposure to ozone is found to be significant in terms of the health effects in these countries), sometimes in combination with one-hour standards. The preliminary work was also to identify issues relating to the achievability of tighter ozone standards, for consideration in the review of the NEPM.

In May 2004, a workshop for health experts was held to seek advice about the health information that will need to be taken into account in assessing the appropriateness of the current ozone standards, particularly the appropriateness of the current one and four-hour averaging periods.

At the recommendation of health experts, an analysis of the profile, time and duration of elevated ozone levels in the major urban airsheds in Australia was commissioned to feed into an assessment of the most health protective averaging period in the Australian context (this analysis was carried out by the CSIRO and used ozone monitoring data from jurisdictions). In August 2004, a workshop was held to obtain advice from ozone monitoring and modelling experts about ozone trends and background levels in individual jurisdictions and to discuss ozone formation patterns.

An Issues Paper was prepared and placed on the EPHC website in May 2005 along with the ozone data analysis. Comment was sought from a range of industry, community and government stakeholders. Given the technical nature of the Issues Paper, consultation was targeted at stakeholders with interest in the issues. The paper formed the basis of discussion in two consultation sessions held during July

2005 in Brisbane and Melbourne. Twelve written submissions were received in response to the Issues Paper.

The review has been chaired by Ms Lisa Corbyn, the New South Wales member of the NEPC Standing Committee. A review team was established with representatives from Victoria, the Commonwealth, New South Wales, South Australia, enHealth Council and the CSIRO (as observer). A Jurisdictional Reference Network was also established to provide jurisdictional advice for the review.

### **Summary of issues paper**

The Issues Paper incorporated key advice from the Woolcock Report, the health and monitoring/modelling experts workshops and the CSIRO analysis. The paper also included updated information on the health effects of ozone, overseas ozone standards, background ozone levels, ozone trends and issues relevant to measuring exposure to ozone. Further, the paper considered issues relevant to the analysis of the achievability of the ozone standards in the NEPM review.

The following issues were highlighted:

- Since 1998 the body of data suggesting a link between exposure to ozone and increases in daily mortality and hospital admissions, especially during the warmer months, has increased. Health studies have shown that adverse health effects are associated with exposure to ozone for different averaging periods.
- A number of overseas jurisdictions (the World Health Organisation, the European Union, the United States and California) have adopted eight-hour ozone standards (sometimes in conjunction with a one-hour standard) on the basis that eight-hour ozone exposures have been judged to pose a significant health risk in those jurisdictions.
- The analysis of ozone episodes in the major Australian urban airsheds showed that ozone peaks were typically of short duration. For example, the duration of periods when the one-hour average concentration exceeded 0.06ppm was one hour in 30 to 50% of cases, two hours in 20 to 30% of cases and five hours or longer in up to 20% of cases. Sydney experienced the episodes of longest duration (up to nine hours), followed by Melbourne and Perth (up to seven hours). The extended durations for ozone levels were uncommon in Melbourne and Perth but not in Sydney.
- Ozone monitoring data and ozone trends indicate that achieving the current ozone standard is a major challenge for Sydney. Should a stricter standard or an eight-hour standard consistent with international standards/guidelines be adopted, achievability could also become an issue for some of the other major urban airsheds.
- Current estimates of background ozone levels in Australia range between 0.02 and 0.04ppm. This is a significant issue in assessing the ability of jurisdictions to meet tighter standards or an eight-hour standard consistent with international standards/guidelines. There is no agreed methodology for calculating background levels more accurately.

## **Outcomes of consultation**

### ***Appropriate averaging periods***

There was general support for a one-hour averaging period combined with a longer averaging period. The majority of submissions, particularly those from government agencies, considered that the health data supported a one-hour and an eight-hour standard. The majority of submissions identified that health protection was the primary consideration in setting the standard.

There was also a general view that averaging periods should reflect Australian conditions. However, there were differing opinions on what the Australian monitoring data indicated about the averaging periods. It was noted in a number of submissions that the length of ozone episodes in most Australian airsheds suggested that a one and four-hour standard was more relevant to Australian exposure and would be more suitable. However, it was also noted that the longer ozone episodes experienced in Sydney were the exception to this. In Queensland, where population growth is expected, initial monitoring data indicate that a pattern of longer elevated ozone levels may be occurring at some south-east Queensland monitoring sites. It was noted that further analysis would need to be undertaken to confirm this trend.

It was suggested that a combination of one, four and eight-hour standards could be considered. It was noted that an eight-hour standard would make comparison with ozone monitoring results from other countries easier.

### ***Achievability***

There was general agreement that a detailed assessment of the impacts of any changes to the standards was an important part of the standard setting process. There was some support for the analysis including the cost to jurisdictions of implementing risk management strategies to meet the standards as well as including health benefits.

Stakeholders considered that achievability should be a secondary consideration in setting the level of a standard for health protection. It was suggested that achievability should be incorporated into the timeframe for meeting the standard or into the number of exceedances allowed.

### ***Other issues arising from consultation***

There was general support for the health issues identified in the paper. Stakeholders considered that the standard setting process should consider the full range of sensitivities across the community. As some people respond to ozone at very low levels, it may not be possible to have standards that provide comprehensive protection and this should be made transparent in the final decision on standards.

There was some support for including the impacts of ozone on ecosystems in the standards but it was acknowledged that very little data was available in Australia.

## **Conclusions**

### ***Appropriate averaging periods***

The preliminary work found that a combination of one, four and eight-hour averaging periods is appropriate for the NEPM ozone standards to protect the health of the Australian population. This addresses the health concerns that prolonged exposure to ozone is a significant health risk and the analysis of Australian

monitoring data which indicate that episodes of elevated ozone rarely last more than four hours in the major urban airsheds - the exception to this being Sydney.

#### *One-hour*

Short-term exposure to ozone for one to three hours can result in immediate and reversible health effects such as acute inflammatory responses. These responses are most likely to occur in susceptible groups in the population such as the elderly, young children and people with existing respiratory conditions including asthmatics. The major Australian airsheds all experience one-hour ozone peaks on occasions and this averaging period should be retained.

#### *Four-hour*

People experience increased health effects from ozone over time and at lower concentrations. Four hours is typically as long as elevated ozone levels last in the majority of the major urban airsheds, ie Melbourne, Perth, Adelaide and Brisbane. For these airsheds a combination of a one and four-hour standard, set at appropriate levels, should protect populations against ozone levels of concern.

#### *Eight-hour*

As noted above, people experience increased health effects from ozone with prolonged periods of exposure. Studies show that over six to eight hours people experience decreased lung capacity when exposed to lower levels of ozone than those observed to produce effects in one-hour exposures. Unlike the other major airsheds, six to eight-hour episodes are reasonably common in Sydney in the warmer months. Further analysis is needed to confirm a trend towards longer episodes in south-east Queensland.

Longer exposures of six to eight hours affect, in particular, groups such as outdoor workers and children playing and exercising outdoors in summer. An eight-hour standard, in addition to one and four-hour standards (set at appropriate levels) would offer protection against prolonged ozone exposures, as well as against shorter term peaks of concern.

#### *Implications for jurisdictions*

Any change to reporting requirements under the NEPM would be undertaken after the full review of the NEPM which is expected to be completed by 2008. No additional resources would be required by jurisdictions to monitor or calculate eight-hour averages. It would mean reporting against an additional standard and explaining the results. The implications in terms of achievability will depend on the level at which the standards are set and the associated compliance goals.

The final standards and compliance goals need to be determined taking into account economic, social and environmental considerations including an analysis of the costs and benefits associated with any proposed standards. This will be done through the review of the Ambient Air Quality NEPM and any proposed variation to the NEPM that may be required.

#### *Achievability*

The preliminary work found that the ozone standards should be health based but that achievability was an important aspect of setting compliance goals. A cost benefit analysis should identify a range of possible compliance goals and examine

the implications for jurisdictions of meeting these options. The analysis should take account of non-anthropogenic background levels that are estimated to range from 0.02 - 0.04ppm.

### ***Other issues***

The review of recent studies of the health impacts of ozone and the findings on health outcomes and susceptible groups reported in the Issues Paper and the summary of submissions document should be incorporated into the review of the NEPM.

The standards should seek to protect all sensitive groups in the community, and where susceptible groups are not able to be wholly protected by the standards, this should be documented. Children with asthma are considered to be a particularly significant sensitive subgroup in relation to ozone. Other sensitive subgroups are people with existing conditions such as chronic respiratory conditions and cardiovascular disease, the elderly and people who may have an inherent genetic susceptibility to ozone. Active individuals who spend long periods outdoors in summer such as outdoor workers, children and athletes are also susceptible because of their potential exposure.

### **Recommendations**

On the basis of the analysis conducted by the review team and the outcomes of consultation it is recommended that:

1. The appropriate averaging periods for ozone standards in the Ambient Air Quality NEPM are one, four and eight hours.
2. The level at which the standards are set be determined as part of the review and any subsequent variation of the NEPM. The decision should be informed by an assessment of the health risk and population exposure.
3. A cost benefit analysis be conducted as part of the review and any subsequent variation of the NEPM which evaluates a range of possible compliance goals for the standard (including a base case which is the equivalent of the current values) to assess the achievability of meeting the options presented.
4. As part of the review and any subsequent variation of the NEPM, consideration be given to making achievability issues more transparent in setting the ozone standard, for example by setting a health based level and taking account of achievability via:
  - the number of years allowed to achieve the standard;
  - the number of exceedances allowed;
  - reporting on a statistical measure such as the 98<sup>th</sup> percentile rather than the highest levels recorded; and
  - considering whether there should be some flexibility to take account of the differences in airsheds, such as significantly different natural sources and climatic influences.
5. In the review and any subsequent variation of the NEPM, background ozone levels (defined as non-anthropogenic) ranging from 0.02 - 0.04ppm should be considered in assessing the achievability of the standards.