Briefing Note on Ministry of Environment's (MOE) Proposed Annual Air Standards Rather Than 24 Hour Standards for Nickel, Uranium and Benzo(a)pyrene

We support the annual standards and ask them to be finalized and brought into force as soon as possible but we are concerned about the potential health and environmental impacts as a result of MoE's proposal to establish a "screening value" as opposed to 24-hr air standard for nickel, uranium and benzo(a)pyrene.

MoE has stated that there are toxicological reasons for establishing health based 24 hr standards for benzene, 1,3 butadiene and chromium VI. We assume, given MOE's stated position, that MOE will establish short term standards for benzene, 1,3 butadiene and chromium VI, therefore the need for short term standards for those three contaminants will not be addressed in this briefing note.

BACKGROUND

New and updated standards are derived from proposed Ambient Air Quality Criteria (AAQCs) which are effect-based levels in air, with variable averaging times (e.g., 24 hour, 1 hour and 10 minutes) appropriate for the effect that it is intended to protect against.[1] In July of 2009 MoE proposed new/updated air standards for eight substances including: nickel, uranium and benzo(a) pyrene developed from new or updated AAQC.

- For nickel and nickel compounds the MoE proposed to establish updated half hour[2] and 24-hr average air quality standards based on proposed updated ambient air quality criterion that account for the carcinogenic and non-carcinogenic effects of nickel and nickel compounds.

- For uranium and uranium compounds the MoE was proposing half hour and 24-hr average air quality standards derived from proposed 24-hr ambient air quality criteria based on kidney toxicity associated with uranium and uranium compounds.

- For benzo(a)pyrene (as a marker for polycyclic aromatic hydrocarbons-PAHs) the MoE proposed half hour and 24-hr average air quality standards derived from proposed annual and 24-hr ambient air quality criterion based on the carcinogenicity associated with PAH compounds.

[1] Ontario Ministry of the Environment. 2008. Ontario's Ambient Air Quality Criteria.

[2] Half hour standards will eventually be phased out as new air dispersion modelling requirements under O.Reg 419 are phase in for various industrial sectors, however until this transition is complete half hour standards will still apply to some sectors.

MoE sets proposed 24-hr air standards derived from the proposed annual ambient air quality criteria (AAQC) by using a multiplication factor of five such that the proposed 24 hour standards are five times greater than the annual criteria to account for meteorological variations. These standards were established using the current MOE approach to standard-setting and implementation.

It is our understanding that MoE converts annual criteria to a 24-hr standard to accommodate the use of the advanced air dispersion models prescribed under O. Reg. 419 for compliance and approvals purposes and to facilitate monitoring.

As sectors are required to use the more sophisticated US EPA air dispersion modelling to demonstrate compliance, most of the standards are converted or set as 24 hour averaging times. A few exceptions to the 24 hour standard exist to accommodate shorter term effects like odour and longer term effects like soiling.

The benefit of this approach is that a 24 hr standard also provides some reassurance of protection against acute and subchronic effects, the latter of which are not well studied in toxicological literature.

ISSUE

(a) Industry's Position

Industry stakeholders argued that, for chronic effects such as carcinogenicity, compliance should be assessed solely on an annual average, as opposed to a 24-hr standard. According to industry a 24-hour air standard based on a conversion factor is not appropriate because it is not related to the adverse effects resulting from the exposure. Furthermore, industry stakeholders observed that these converted 24-hr standards may trigger an alteration of standard process even if the annual average – which is directly tied to the toxic effect – can be met. Industry also raised concerns that that proposed standards were not consistent with Ontario's Open for Business Initiative.

(b) MoE's Position.

In response to industry's concerns, the MoE reversed its position and is no longer considering establishing 24- hr air standards. Instead it is proposing to establish "screening values" as opposed to a 24- hr air standard for nickel, uranium and benzo(a)pyrene and proposing the ambient air quality criteria as annual average standards. The MoE's position is that annual average standards would be sufficient, given that the health concerns with nickel, uranium and benzo(a)pyrene are primarily due to exposure over the long term as opposed to the short term. It should be noted that the "screening value" unlike a 24 hr air could not be enforced in court. It would merely serve to alert the MoE that the facility could have an exceedance of the annual standard. MoE's proposal to establish a "screening value" as a means to regulate air contaminants is unprecedented.

(c) ENGO and First Nations Position on "Screening Values"

ENGOs and First Nations participants' position is that the annual average standard is only acceptable if a short term standard accompanies it. We have indicated to the MoE that a 24-hr standard is necessary to protect against periods of elevated exposure that may have sub-chronic or acute effects.

While an annual standard would protect against a chronic effect like carcinogenicity, it cannot protect against health impacts that may occur due to exposures in the shorter term such as on a daily or monthly basis, unless that health impact would only occur at an exposure concentration that is so high that an exceedence of the annual average standard would result.

SUBSTANCE ANALYSES

(i) Nickel and Nickel Compounds

July 2009 Proposal

The MoE proposed (EBR Reg No. 010-7188), based on their toxicological assessment[3], two annual AAQCs and one 24 hour AAQC for nickel and nickel compounds based on carcinogenic and non carcinogenic effects associated with exposure to nickel and nickel compounds.

As mentioned above, the AAQC are used to set the standards and thus are key to this discussion.

The proposed AAQCs were:

- annual AAQC of 0.02 µg/m^3 for Nickel and Nickel compounds in the PM10 size fraction
- annual AAQC of 0.04 µg/m^3 for Nickel and Nickel compounds in the Total Suspended Particulate (TSP) fraction
- 24-hr average of 0.1 µg/m^3 for Nickel and Nickel compounds in the PM10 size fraction

Based on the AAQCs, the MOE proposed the following 24-hr standards in July 2009:

- 24-hr average of 0.1 µg/m^3 for Nickel and Nickel compounds in the PM10 size fraction (same as the 24 hour AAQC)
- 0.2 µg/m3 for Nickel and Nickel compounds in the Total Suspended Particulate Fraction (based on a multiplication of 5 of the annual AAQC for TSP fraction)

[3] With each proposed updated or new air standard or criteria MoE publishes a rationale document which reviews the toxicological information on the substance. These documents were made available to the public through the Environmental Bill of Rights registry when the proposed standards were posted for public comment.

February 2011 Proposal

As of February 2011, due to the industry concerns described above, MOE is NO longer proposing a 24 hr standard that matches the 24-hr AAQC but is proposing an annual standard of 0.04 µg/m3 for nickel and nickel compounds.

In addition to the dropping of the 24 hr standard, MOE has chosen the less protective of the two annual AAQCs as the annual standard - the AAQC based on TSP fraction. The AAQC for the PM10 fraction is not being proposed for the basis of the annual standard.

The February 2011 proposal offers less environmental and human health protection than the July 2009 proposal. For example, drawing from the July 2009 MOE document[4] titled, "Rationale for the Development of Ontario Air Standards for Nickel and Nickel Compounds" (herein referred to as 'Nickel Rationale Study'), the following excerpt supports the need a standard based on PM10 in addition to one based on TSP:

> *From the health effects point of view, it is reasonable to base the AAQC for nickel on the PM_{10} fraction. However, the emission and deposition of persistent metals into the environment, especially metals found in the larger fraction of emissions, may also be of concern. For this reason, an AAQC for nickel in the TSP is also being proposed. [emphasis added]*[5]

Regarding sub-chronic and acute effects, the Nickel Rationale Study discusses acute respiratory effects including the onset of asthma.[6] It is worth noting that California has an acute (1 hr) standard/guideline for Nickel, based on respiratory effects.[7] One of the studies California uses to support this standard/guideline is observed respiratory impacts on a sensitive population at concentrations as low as 67 µg/m3 over 30 minutes (pages 147-149).

A peak of 67 ug/m3 for 30 minutes could easily occur while still maintaining compliance with the annual average standard of 0.4 µg/m3 proposed by MOE as of Feb 2011. It is worth noting that, according to the rationale document, North Carolina and Massachusetts also have annual and short term standards or guidelines for Nickel.

Because the Nickel Rationale Study was written to support the initial proposal which included annual and 24 hr AAQCs and 24 hr standards, it does not address whether just an annual average standard based on TSP is protective of all the observed health effects including acute respiratory effects.

(ii) Uranium

July 2009 Proposal

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[4] Standards Development Branch. Ministry of the Environment. July 2009. Rationale for the Development of Ontario Air Standards for Nickel and Nickel Compounds.
[5] Ibid. p. 8
[6] Ibid. p. 31 and 150
[7] Ibid. p. 50

MoE established short-term effects-based 24-hr AAQCs of 0.03 µg/m^3 in PM10 fraction and 0.06 µg/m^3 in TSP fraction based on the most sensitive health effect of kidney toxicity .Both AAQCs are also being proposed as 24 hr standards (see EBR 010 7192).

February 2011 Proposal

As of February 2011 MoE is proposing only an annual standard at the same concentration as the 24 hr standard for the PM 10 fraction proposed in July 2009. Typically, annual average standards are less than 24 hr based standards or AAQC to account for meteorological variations.

The Uranium Rationale Study[8] shows that the 24 hr standard proposed in February 2009 was based on a lifetime (chronic) exposure and developed from a biokinetic model. It is worth noting that the rationale document with respect to kidney toxicity refers to both chronic and subchronic or acute exposure studies and finds "renal effects following acute exposure to inhaled uranium." [9]

In addition, according to the rationale document, several jurisdictions have short term standards/guidelines for Uranium including Texas, Wisconsin, Washington, Arizona, North Dakota and New York.[10]

Once again, because the rationale document was written to support a 24 hr based standard it does not address the adequacy of only an annual standard at protecting against effects caused by acute or subchronic exposures.

(iii) Benzo (a) pyrene B[a]P

July 2009 Proposal

MoE proposed updated annual and 24 hr AAQCs of 0.00001 and 0.00005 µg/m^3, respectively, for B[a]P as a representative of PAHs based on carcinogenicity. From the AAQCs, MOE proposed a 24-hr based standard of 0.00005 µg/m^3 for B[a]P.

February 2011 Proposal

As of February 2011 the MoE is proposing only an annual standard of 0.00001 µg/m3 for B[a]P as a surrogate for all PAHs.

According to the rationale document, studies have shown neurodevelopmental effects due to exposure during sensitive foetal developmental stages of pregnancy.[11] These short

[8] Standards Development Branch. Ministry of the Environment. July 2009. Rationale for the Development of Ontario Air Standards for Uranium and Uranium Compounds.
[9] Ibid. p. 16
[10] Ibid. p. 40-41

sensitive periods are better protected by a 24 hr standard than an annual standard which would allow for peak short term concentrations. Given the rationale document was written to defend a proposed 24 hr standard, it does not address the adequacy of an annual standard at protecting health from shorter term exposure effects such as neurodevelopmental and reproductive impacts.

DISCUSSION

ENGOs and First Nations also raised concerns that relying solely on an annual average would not ensure protection of human health and the environment, given that the regulatory framework for air pollution in Ontario does not consider cumulative effects. Consequently, reliance on an annual average standard alone will not be protective of human health and the environment, as it fails to take into account total loading of air contaminants into the environment and total exposures.

Unlike the United States, Ontario does not have technical standards (such as MACT-maximum achievable control technology or BACT best available control technology) that require a base level of control technology on industrial facilities (except for two sectors). Instead, Ontarians must rely on the certificate of approval system which is driven by the need for industrial operations to demonstrate that they can meet the air standards. Thus, without effective standards industry may not invest in pollution control equipment, and capital investment by industry in Ontario will continue to lag behind that of industry in the United States.

ENGOs and First Nations also observed that MoE's reliance on solely an annual average standard would mean that a company could be in non-compliance for a year before MoE could undertake enforcement measures. Consequently, the reliance on an annual average standard alone would undermine MoE's ability to take enforcement measures against a facility that was in non-compliance.

24 hour Standards for Benzene, 1,3 Butadiene and Chromium VI

In addition, although MOE has committed to effects- based 24 hr standards for benzene, 1,3 butadiene and chromium VI there has been no discussion of these standards or suggestions of proposed values. We are concerned that once the annual standards for these three air toxics are finalized and approved that the shorter term 24 hr standards will not be a priority of government. Our position is that these standards should be developed as soon as possible and be set at levels designed to protect against acute and subchronic effects including developmental effects.

RECOMMENDATION

As mentioned above, we support the annual standards and wish to see the annual standards brought into law as soon as possible, but we also request that the MoE conduct

[11] Standards Development Branch. Ministry of the Environment. July 2009. Rationale for the Development of Ontario Air Standards for Polycyclic Aromatic Hydrocarbons, p. 24-25

the necessary analysis to determine if and what 24 hr standards may be needed to protect against health effects from short term exposures.

We ask that this analysis of the need for short-term standards begin as soon as the annual standards are finalized and approved. For substances found to have acute and subchronic effects that require a 24 hour standard, we ask that the 24 hr standard be finalized within a year.

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By Ramani Nadarajah (CELA), Elaine MacDonald (Ecojustice), and Lynda Lukasik (Environment Hamilton)

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