

Canada Gazette



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Part I

Partie I

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DEPARTMENT OF THE ENVIRONMENT

CANADIAN ENVIRONMENTAL PROTECTION ACT, 1999

Federal Government Response to Comments Received on the Notice of Intent to Recommend That Ozone and its Precursors Be Added to the List of Toxic Substances Under the Canadian Environmental Protection Act, 1999

Introduction

On June 9, 2001, the ministers of the Environment and of Health published their intent to recommend that ozone and its precursors (nitrogen oxides (NO_x) [nitric oxide (NO) and nitrogen dioxide (NO₂)] and volatile organic carbons (VOCs)) be added to the List of Toxic Substances in Schedule 1 of the *Canadian Environmental Protection Act, 1999* (CEPA 1999). The Notice of Intent was published in the *Canada Gazette*, Part I, for a 60-day comment period. This report summarizes the comments received and the federal response.

The Notice of Intent on ozone and its precursors builds on the Science Assessment Document (SAD) for Ground-Level Ozone, which was published in the *Canada Gazette*, Part I, on October 14, 2000. The SAD concludes that there is a significant association between ambient ozone and adverse health effects and that significant adverse effects to human health and vegetation are occurring at ozone levels currently experienced across Canada. The SAD further specifies that ground-level ozone is formed in the atmosphere through chemical reactions involving precursors, namely nitrogen oxides and volatile organic compounds. Without the listing of ozone and its precursors by name on Schedule 1, the ministers would not have the legislative mechanism in place to control ozone and its sources.

Response to Comments

A total of 14 submissions were received. Of the 14 submissions, one was from a province and 13 were from industry or industry associations. Ten of these submissions supported or did not specifically object to the recommendation for ozone itself. All of the submissions received were against adding the precursors to ozone to Schedule 1. Concerns with the process and uncertainties in the science were the most frequent issues raised. These submissions are mentioned in the *Order Adding Toxic Substances to Schedule 1 to the Canadian Environmental Protection Act, 1999* which appears in the proposed Regulations section on page 2320.

A summary of the most frequently raised comments and the responses of the federal government are outlined in the table below.

MINISTÈRE DE L'ENVIRONNEMENT

LOI CANADIENNE SUR LA PROTECTION DE L'ENVIRONNEMENT (1999)

Réponse du gouvernement fédéral aux commentaires sur l'avis d'intention de recommander l'ajout de l'ozone et de ses précurseurs à la Liste des substances toxiques aux termes de la Loi sur la protection de l'environnement (1999)

Introduction

Le 9 juin 2001, les ministres de l'Environnement et de la Santé ont rendu publique leur intention de recommander l'ajout de l'ozone et de ses précurseurs (les oxydes d'azote (NO_x), [le monoxyde d'azote (NO) et le dioxyde d'azote (NO₂)] et les composés organiques volatils (COV)), à la Liste des substances toxiques de l'annexe 1 de la *Loi canadienne sur la protection de l'environnement, (1999)* [LCPE 1999]. Cet avis d'intention a été publié dans la *Gazette du Canada*, Partie I, pour une période de commentaires de 60 jours. Le présent rapport est un résumé des commentaires reçus et des réponses du gouvernement fédéral.

Cet avis d'intention sur l'ozone et ses précurseurs est fondé sur le Rapport d'évaluation scientifique (RES) sur l'ozone troposphérique publié dans la *Gazette du Canada*, Partie I, le 14 octobre 2000. Ce RES arrive à la conclusion qu'il existe une étroite corrélation entre l'ozone de l'air ambiant et les effets négatifs sur la santé et la végétation et que ces effets sont constatés à des niveaux d'ozone que l'on rencontre couramment, partout au Canada. Le RES précise de plus que l'ozone de la basse troposphère se forme dans l'atmosphère, par réactions chimiques impliquant des précurseurs, notamment les oxydes d'azote et les composés organiques volatils. À défaut d'inscrire l'ozone et les noms de ses précurseurs à la liste de l'annexe 1, les ministres n'auront pas les outils juridiques nécessaires pour contrôler l'ozone et ses sources.

Réponses aux commentaires

Nous avons reçu 14 soumissions au total. Sur ces 14 soumissions, l'une provenait d'une province et 13 provenaient de l'industrie ou d'associations du secteur industriel. Dix de ces soumissions soutenaient la recommandation pour l'ozone en soi ou ne s'y opposaient pas spécifiquement. Toutes les soumissions reçues étaient contre l'ajout des précurseurs de l'ozone à l'annexe 1. Des inquiétudes quant au processus utilisé et des incertitudes à propos de la science étaient les points soulevés le plus souvent. Ces soumissions sont mentionnées dans le *Décret d'inscription de substances toxiques à l'annexe 1 de la Loi canadienne sur la protection de l'environnement (1999)* qui paraît dans la section des règlements projetés à la page 2320.

Le présent tableau est un résumé des commentaires les plus fréquemment formulés et des réponses du gouvernement fédéral à ces commentaires.

| No. | COMMENT | RESPONSE |
|----------|---|---|
| 1 | PROCESS | |
| 1A | <p>The ministers did not conduct a rigorous scientific assessment under CEPA 1999 (e.g., a Priority Substances List (PSL) assessment, screening of the Domestic Substances List (DSL), or review of another jurisdiction); therefore, the process isn't legal under CEPA 1999. Declaring ozone and its precursors toxic based upon a creative legal interpretation sets a dangerous precedent and undermines the scientific basis of CEPA 1999.</p> | <p>Under subsection 90(1) of CEPA 1999, "the Governor in Council may, if satisfied that a substance is toxic, on the recommendation of the ministers, make an order adding the substance to the List of Toxic Substances in Schedule 1." In developing this recommendation, the ministers may use a number of approaches to be satisfied that a substance is "toxic or capable of becoming toxic". These include, in addition to the processes prescribed for substances on the DSL and PSL, the use of other appropriate assessments to satisfy the Governor in Council that a substance is CEPA toxic.</p> <p>The ministers' recommendation is based on sound science conducted over the past decade. The Ozone SAD went through a scientific peer-review and a consultation process with federal, provincial and territorial representatives. Supporting studies from the United States, the United Kingdom, and the World Health Organization have consistently demonstrated the impacts of ozone on public health. The Ozone SAD is considered to be a scientifically sound assessment of the effects of ozone on human health and the environment, and combined with the CEPA definitions of "toxic" and of "substance" in section 64 and subsection 3(1) respectively, it provides the ministers with an appropriate basis for proceeding with a recommendation under subsection 90(1).</p> <p>In the case of precursors to ozone, the ministers are confident that a formal PSL science assessment is not required and that the existing science supports the conclusion that the precursors participate in chemical reactions in the environment that result in the formation of ozone, which is toxic. The precursors to ozone satisfy the conditions of section 64 of CEPA, which defines a substance as "toxic" if, among other possibilities, it may enter the environment under conditions that may constitute a danger to human health.</p> <p>In addition, there already exists a precedent for adding precursors to a toxic substance to Schedule 1 of CEPA 1999. Non-chlorinated dibenzodioxin and dibenzofuran, while not assessed for the risks posed by their direct exposure, were added to Schedule 1 because they can lead to the formation of polychlorinated dioxins and polychlorinated furans, which are toxic under CEPA 1999.</p> |
| 1B | <p>If the legal argument is valid, then precursors of precursors could be declared toxic.</p> | <p>Technically, this may be true for some substances if they are capable of "being transformed" or "causing such transformation". However, in practical terms, as noted in the SAD, NO_x and VOCs are considered to be the primary precursors of ozone, management of which will be the most effective to reduce ground-level ozone concentrations.</p> |
| 1C | <p>The Government should undertake a PSL or science assessment. It would help to establish priorities and issues of concern.</p> | <p>In making a recommendation under subsection 90(1) of CEPA 1999, the minister may use a number of approaches to be satisfied that a substance is "toxic or capable of becoming toxic". In making this determination, appropriate scientific assessments other than those prescribed for the PSL process may be used. Ministers are confident that the SAD supports the conclusion that ozone is toxic and that the precursors to ozone satisfy the definition of toxic. A PSL assessment, which does not assess options or set priorities for risk management, would add little to current knowledge and would result in significant delays to the risk management process.</p> <p>The federal government has already outlined some of its priorities to improve air quality in its Interim Plan 2001 on Particulate Matter (PM) and Ozone. The Interim Plan sets out measures where the federal government is best suited to act including a 10-year agenda for cleaner vehicles, engines and fuels (aligned with those in the United States), an upgraded air monitoring network across Canada and an expanded National Pollutant Release Inventory to ensure more reporting of emissions. Currently, analytical approaches to multi-pollutant emission reduction strategies (MERS) are being developed in consultation with provinces and stakeholders. MERS activities are advancing for key industrial sectors. This analytical work will feed jurisdictional implementation plans to be completed in the 2002-2003 timeframe.</p> |
| 1D | <p>Research, investigation, and evaluation in section 68 was not followed.</p> | <p>The ministers' recommendation is based on sound and appropriate science. Section 68 is not mandatory but allows the ministers to conduct research.</p> |
| 1E | <p>Ozone cannot be dealt with under Part 5 since it does not meet the definition of section 64. Ozone is not released into the environment, rather formed in the atmosphere from precursors.</p> | <p>Environment Canada is satisfied that the terms "enter" or "may enter" are sufficiently broad enough to capture ground-level ozone.</p> <p>Ozone satisfies the conditions of section 3 of CEPA 1999, which defines a "substance" as "any matter that is capable of being dispersed in the environment." Furthermore, based on the evidence in the SAD, ozone meets the criteria in section 64, which sets out that a substance is "toxic" if, among other possibilities, it is "entering or may enter the environment in a quantity or concentration or under conditions that constitute or may constitute a danger to human life or health".</p> |
| 1F | <p>Ozone is not on the DSL. Toxicity under Part 5 is intended for commercial, manufactured, or imported substances.</p> | <p>Toxicity declarations under Part 5, which concerns the control of toxic substances, are not limited to substances on the DSL.</p> |

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| 1G | The Canada-wide Standard calls for a review of new information by the end of 2005. It is premature to add VOCs as a group to Schedule 1 prior to the completion of this review. | The review of the Canada-wide Standard is intended to determine whether the CWS target should be revised for the year 2015. While it may also provide some new information to assist in the design of risk management measures for NO _x and VOCs, it is not expected to alter the long-standing fact that VOCs and NO _x are the two primary substances contributing to ozone formation. |
| 1H | What is the process to de-list VOCs from Schedule 1? | The process to amend the listing of VOCs on Schedule 1 is the same process used to list a substance on Schedule 1. |
| 2 | OVERLAP AND DUPLICATION | |
| 2A | The Notice causes an unnecessary regulatory burden. It causes overlap and duplication with existing programs and undermines the CWS process. | Adding ozone and its precursors to Schedule 1 does not, in itself, control the substances in any way; therefore, it does not cause overlap and duplication with existing programs. It establishes the additional legal authority for the federal government to take the actions under CEPA 1999 that it has already committed to work towards under these programs. The federal government is committed to the CWS for PM and Ozone and has published its proposed actions to help achieve these standards in the Interim Plan 2001 on PM and Ozone. Together with the provinces and territories, the federal government will continue the current process of mapping out emission reduction strategies for key industrial sectors. Action is expected to be taken by the jurisdiction best situated. While the federal government may be best situated to act in some cases, many of the actions required are expected to be implemented by provinces and territories. |
| 2B | The development of an instrument within two years is not consistent with CWS timelines. | The CEPA requirement to develop an instrument within two years (section 91) does not apply to ozone and its precursors since they were not subject to CEPA paragraph 77(6)(b). Nonetheless, early actions will be needed if governments are to collectively achieve the CWS target by 2010. |
| 2C | Creates confusion by adding VOCs that were previously found to be not-toxic under CEPA 1999 (e.g., toluene, xylenes). | The previous science assessments for toluene and xylene assessed their direct toxicity to human health and did not assess the contribution of these substances to the formation of PM and ozone. The federal government doesn't believe that this will cause confusion; however, it will manage communications as necessary. |
| 3 | NECESSITY | |
| 3A | Provinces, under existing management regimes, can adequately address ozone. | Although provinces and territories have effective initiatives in place, experience has shown that even the combined efforts of all levels of government and industry have not been adequate to manage smog. In fact, several comments that were received recognized the need for further actions to improve air quality and supported the federal government's Clean Air Agenda. Canada needs a concerted, cooperative effort by all jurisdictions to achieve the PM and Ozone CWS. The federal, provincial, and territorial governments have committed to further actions under the CWS and it is now incumbent upon all jurisdictions to deliver on these commitments. The federal government has committed to do its part to help achieve the CWS and has outlined its initial actions in its Interim Plan 2001 on PM and Ozone. It is imperative that the federal government has access to the full range of "CEPA tools" to be able to deliver these commitments. |
| 3B | The Government should deal with ozone under CEPA 1999, Part 3 (environmental quality objectives). | Part 3 of CEPA 1999 is available if needed, but may not be sufficient. The federal government needs access to all "CEPA tools", such as pollution prevention plans and regulations, which are only available if a substance is listed on Schedule 1. |
| 3C | Rather than declaring ozone and its precursors toxic, the government should pursue voluntary reductions (e.g., from mobile and point sources and consumer products in geographical areas where they will be most effective). | The Government recognizes and commends the significant achievements that industry has made towards reducing emissions of PM ₁₀ , ozone, and their precursors and will continue to work with industry to achieve additional reductions, where necessary; however, more needs to be done to protect the health of Canadians. |
| 3D | The majority of Canada is NO _x -limited thus reducing VOCs in NO _x -limited areas may have little impact on ozone. | NO _x emitted during daylight hours in the summer is the primary cause of elevated ambient ozone levels, not just in urban areas, but on large regional scales. Acceptance of this conclusion by many jurisdictions in the world has resulted in the establishment of aggressive NO _x reduction programs to address ozone. Reducing VOCs in urban areas has the potential to reduce ozone in local urban situations which are VOC limited. Generalizations cannot be made between airsheds regarding efficacy of NO _x or VOC control. |
| 3E | Large amounts of biogenic (natural) VOCs in Canada mean reductions in anthropogenic (human-made) emissions are of questionable effectiveness. | Although total biogenic emissions are greater on a national or regional scale, local urban anthropogenic VOC emissions are far greater than biogenic emissions. Local anthropogenic VOC emissions show up as "hot-spots" that are up to 10 times higher than the regional biogenic levels and can contribute significantly to local urban ozone concentrations. |
| 4 | CONSULTATIONS | |
| 4A | There was no advance opportunity to comment as in the PSL process. The surprise of this action is inconsistent with the ministers' "partnership" approach and the concept of inclusiveness in the Framework for Science and Technology Advice. | The federal government is committed to meaningful involvement of stakeholders and has carefully considered comments received throughout the process. The ministers' conclusions are based on the SAD, which involved full consultations. The ministers published the Notice of Intent and this response to comments to initiate the consultation process and provide an additional opportunity for comment before following the formal consultation process under CEPA 1999. Additional opportunities for stakeholder involvement will be available when planning risk management options. It should also be noted that there have been opportunities for consultation for more than a decade on various scientific assessments and risk management efforts on ozone, all of which recognized or focused on the two primary precursors to ozone — NO _x and VOCs. Examples include the SAD for Ground-Level Ozone, the Canadian 1996 NO _x /VOC Science Assessment, international protocols under the United Nations Economic Commission for Europe (UN ECE) to reduce NO _x and VOCs, the Ozone Annex to the Canada-U.S. Air Quality Agreement, and the Ozone CWS. |

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| 4B | The Regulatory Policy and the Cabinet Directive on Law Making commits to "full advantage of opportunities for coordination with other governments and agencies." Advice and comments from the CEPA National Advisory Committee (NAC) were ignored. | Environment Canada consulted with the NAC about the federal government's intention to add ozone and its precursors to the List of Toxic Substances. Despite the concerns of several provinces, in view of the serious adverse effects that ozone at current levels is having on human health and the environment and the need to have the full range of "CEPA tools" available to take action where necessary to resolve the ozone problem, the ministers decided to proceed with the publication of the Notice of Intent. The ministers are fully committed to continued cooperation and collaboration with provincial and territorial governments on smog through efforts to implement the CWS for PM and ozone. While the federal government may be best situated to act in some cases, many of the actions required are expected to be implemented by provinces and territories. |
| 5 | COMMUNICATIONS | |
| 5A | There is a stigma around the "toxic" label as seen by the public. There is also potential for public confusion with stratospheric ozone. | The public is well aware of the health effects of smog and the need to improve Canada's air quality. Although a certain amount of public confusion between tropospheric and stratospheric ozone has existed for more than a decade, careful communications with the public will continue to be a component in the path forward. |
| 6 | ECONOMICS | |
| 6A | A blanket toxic declaration puts an unfair burden on small sources (e.g., the use of VOCs has already been significantly decreased in the paints and coatings and chemical industries) and may affect the viability of some industries. It will be difficult for industry to focus on VOCs of most concern if all are deemed toxic. | The addition of ozone and its precursors to Schedule 1 does not, in itself, control the substances in any way. Therefore, there are no costs or benefits associated with adding ozone and its precursors to Schedule 1, as this initiative is solely based on science. Preliminary economic analyses to support risk management actions for reductions in precursor emissions were conducted jointly with the provinces and territories when developing the ozone CWS. Additional economic analyses will be conducted as required when developing appropriate strategies and control instruments. If the federal government proposes regulations or other instruments for these substances, it will undertake an assessment of the impacts associated with the proposed instruments. CEPA 1999 provides for an open and transparent process when developing regulations or instruments. |
| 6B | The Expert Panel noted that costs associated with reducing emissions may be underestimated and human health benefits overestimated. The Panel also concluded that more and better cost-benefit analyses are required before standards are set and policy is made. | The analysis clearly demonstrates benefits for Canadians. The numbers generated were based on the best information available at the time that the analyses were performed. Work is already underway to address issues raised in the Expert Panel report. In addition, both Government and industry are working to improve the methodologies and tools for future economic analyses, including improved benefit and cost quantification. |
| 6C | Detailed regional modelling is needed but is not available for most of Canada. | Regional modelling is a relevant tool for assessing the human health and economic effects of any emission changes at the regional, national and international level. Also, in developing implementation plans for the achievement of the CWS, local jurisdictions may have to consider modelling. Depending on the subject at hand, modelling will be pursued as a collaborative effort between the federal, provincial and territorial governments. A number of modelling efforts have been conducted or are underway in such areas as the Lower Fraser Valley (British Columbia), Alberta and Ontario. |
| 6D | The declaration of toxicity may cause potential trade impacts. The competitiveness of Canadian industry could be jeopardized. | The addition of precursors to ozone to Schedule 1 does not, in itself, control the substances in any way. Therefore, there are no trade impacts in adding the precursors to Schedule 1. Impacts of any control measure will be analyzed and considered during the risk management phase. |
| 6E | The declaration of toxicity could have implications on emissions trading for NO _x (and potentially VOCs). | Adding ozone and its precursors to Schedule 1 of CEPA 1999 does not preclude the use of emissions trading, if it is deemed an appropriate tool during the risk management phase. |
| 7 | UNINTENDED CONSEQUENCES | |
| 7A | Controlling NO _x in VOC-limited areas may increase ozone formation downwind. | The phenomenon of NO _x titration implies the potential for small or even moderate decreases in NO to be insufficient or result in temporary localized increases in ozone concentrations. In regions of very high local NO emissions (such as urban weekday NO emissions), NO scavenging (reaction 5) will dominate over ozone forming reactions (reactions 1 & 2)*. Many urban regions may exhibit an ozone "donut" effect, in which the highest NO emitting regions have lower ozone than the surrounding areas. Weekend NO emissions in some urban regions are lower, and the resulting increase in ground-level ozone concentrations has been observed. These counter-productive results only occur for low to moderate NO _x reductions, and it is recognized that even greater reductions in NO emissions will result in regional ozone decreases. *Refer to Table 2.1 and Figure 2.1 of "Precursor Contributions to Ambient Fine Particulate Matter in Canada" May 2001. |
| 8 | RISK MANAGEMENT | |
| 8A | A sense of source attribution is required to identify the proportional share of the cost burden for each sector. | Source attribution and cost impacts are relevant to the risk management stage. A number of provincial initiatives are already in place to determine the source attributions and cost impacts in some provinces. Federal program initiatives will mostly focus on providing these figures on a national scale. |
| 8B | At present, there is no one control technology that can adequately address all precursors. | It is not expected that one control measure or technology will meet all aspects of managing ozone and precursors. A balance of control measures and technologies will be required. |

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| 8C | Will the needed atmospheric science be prepared and where in the process will this be done? | Analysis of regional ozone problems is currently underway with key jurisdictions. It is anticipated that this work will continue throughout the implementation of the CWS for PM and Ozone. Current regional analysis will assist in the design of jurisdictional implementation plans, including emission reduction measures for key industrial sectors. As part of the Review of the CWSs for PM and Ozone by end of year 2005, a Report to ministers will be prepared in 2003 on the findings of PM _{10-2.5} CWS. |
| 8D | Transboundary pollution needs to be addressed. | The federal government is committed to addressing transboundary pollution through the CWSs and the Ozone Annex to the Canada-U.S. Air Quality Agreement. |
| 9 | SCIENTIFIC FOUNDATION | |
| 9A | The toxicity of ozone is not clearly demonstrated in the SAD. Causality has not been established. | The toxicity of ozone and causality are clearly established in the SAD. The population-based epidemiological studies provide consistent and coherent evidence of a population-level exposure-response relationship. Non-accidental mortality, hospital admissions, emergency department visits and other adverse effects increase monotonically as ozone concentration increases. These epidemiological relationships are given significant support from work with human volunteers and animals. Controlled human exposure studies have identified a dose-response relationship for lung function changes, symptoms and airway inflammation under a variety of conditions. Field (camp and panel) studies with children and controlled human exposure studies have identified several sensitive sub-groups, such as asthmatics. Animal studies provide evidence of mechanisms for acute and chronic effects of ozone, including mortality. While it is possible to establish causality with epidemiological evidence alone, it is quite clear that the causality of ozone-induced health effects is not based solely or even primarily on epidemiological relationships. |
| 9B | The SAD did not conclude that ozone and the listed precursors are toxic. | The SAD did draw this conclusion for ozone. In its conclusions the SAD states that "Combining the information, there is convincing evidence of a significant association between ambient ozone and adverse health effects." Based on the evidence presented in the SAD, which is supported by the previous NO _x /VOC Health Objective Working Group report, it is quite clear that ozone is toxic. The SAD further specifies that ground-level ozone is formed in the atmosphere through chemical reactions involving precursors, namely nitrogen oxides and volatile organic compounds. Refer to comment #1A regarding the process to add the precursors to Schedule 1. |
| 9C | The declaration of toxicity should not be based on the SAD as it was not a consensus document. | The SAD is accepted as a credible review of scientific information available at that time and was agreed to by all provinces and territories except Alberta. Alberta's position has been identified in the SAD. |
| 9D | The degree to which ozone is responsible for effects caused by exposure to mixtures of compounds is not clear. | The science provides clear evidence of ozone-induced injury to human health. Based on the camp, panel, clinical and animal toxicological evidence, there is more than sufficient evidence to conclude that ozone, at current levels of exposure, causes adverse health effects in humans. While the epidemiological studies are carried out in an environment of multiple pollutants, the models used in these studies are designed to provide some indication of the independence of effects of the various pollutants. Combined, the scientific evidence provides clear evidence of ozone-induced injury to human health. |
| 9E | Recent publications indicate ambiguous findings on the association between ozone and daily mortality. | It is unnecessary to prove mortality when drawing conclusions on the toxicity of a substance. Under section 64, a substance is toxic if it constitutes or may constitute "a danger in Canada to human life or health". The SAD provides a coherent picture of a variety of adverse health impacts attributable to ozone based on epidemiological, clinical, panel and toxicological studies. Additionally, Health Canada has continued to monitor and analyze the literature on ozone and other air pollutants since the time of the publication of the SAD. New work has demonstrated strong associations with specific disease states and recent work on mechanistic issues is of significance in findings on lung damage, blood clotting factors, and inflammatory mechanisms. |
| 9F | Non-linear chemistry needs to be explicitly considered—reduction of NO _x does not guarantee reduction of ozone. | The robust scientific analyses of many jurisdictions all indicate that the listed precursors have the potential to contribute to ozone formation, that the formation process is non-linear, and that broad categories of NO _x and VOC limited areas exist. This non-linear chemistry is considered in evaluation tools such as 3D regional air quality models and reactivity scales, which are being used in the development of risk management actions. NO _x is the primary cause of elevated ambient ozone levels not just in urban areas but on large regional scales. Acceptance of this conclusion by many jurisdictions in the world has resulted in the establishment of aggressive NO _x reduction programs to address ozone. |
| 9G | The extent of ozone formation is complex and varies under different conditions and in different parts of the country. The Government should evaluate and prioritize the degree to which different VOCs and NO _x contribute to the formation of smog and PM under differing conditions before adding them to Schedule 1. The proposal should identify relative contributions of mobile and large industrial point sources, whether anthropogenic or biogenic. | The federal government recognizes that ozone formation is complex and varies under different conditions and in different parts of the country; however, this does not refute the conclusion that the precursors participate in chemical reactions that result in the formation of ozone, which is toxic. All VOCs have the potential to contribute to ozone formation as defined in the Notice of Intent. Risk assessments are not intended to identify options for control or priorities. Rather, such issues are relevant to the risk management stage and will be considered when identifying priorities for action and developing specific control instruments to reduce emissions of ozone and its precursors. In identifying priorities and control strategies, methodologies are already available (e.g., reactivity scales, 3D air quality models, and other established methodologies) that can be used to determine relative NO _x and VOC contributions. Available modeling tools have been shown to characterize ozone formation sufficiently well, based on studies in all Canadian problem areas. One of these tools — Environment Canada's 3D model (CHRONOS) — is being used in air quality forecasting across Canada. |

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| 9H | Carbon monoxide (CO) is not listed but is a significant contributor to ozone. | In urban regions, CO is not a significant contributing factor to ozone formation, therefore it is not included in the list of precursors recommended. CO may be a significant influence on ozone concentrations in remote areas, but its reactivity and concentrations are too low to be a significant contributor on the urban to rural scale. |
| 9I | Methane is exempted but it is a significant contributor due to abundance. | Although methane, and also ethane, are abundant on a national scale, the relative contribution of methane and ethane to ozone formation is minor on a local scale (particularly in the urban regions that are VOC limited); therefore, in the proposed listing on Schedule 1 of "VOCs that participate in atmospheric photochemical reactions", these substances are among those specifically excluded by definition. |
| 9J | Water vapor, oxygen (O ₂), carbon dioxide (CO ₂), sulfur oxides (SO _x), nitrogen (N ₂), and various free radical intermediates also lead to ozone formation. | Though participants in ozone formation, water vapor, O ₂ and N ₂ cannot be regulated as there are no significant anthropogenic sources of these natural components of the atmosphere. Control of NO _x and VOCs influences the free radicals which are key to ground-level ozone formation. |
| 9K | There is no incentive to switch to alternative VOCs with lower toxicity since all VOCs appear equally toxic. | The appropriate control instruments and alternatives, if needed, will be identified during the risk management phase, whereby the proper incentives will be created to control the various toxics accordingly. |
| 9L | The Government should assess processes, rate, sequence and synergistic effects of atmospheric chemical reactions prior to declaring ozone and its precursors toxic. | These issues have already been appropriately addressed in scientific assessments and reviews (NO _x /VOC Science Assessment 1996, NARSTO Ozone Assessment, 2000, and Precursor Contributions to Ambient Fine Particulate Matter in Canada, 2001), which illustrate that both observations and atmospheric processes, as defined in air quality models, confirm the relationship between the precursors (NO _x and VOCs) and ozone formation. |
| 10 | PRECURSOR DEFINITIONS | |
| 10A | The proposed definitions for precursors of PM ₁₀ and precursors of ozone are confusing and duplicative. The current definitions do not identify which precursors need to be dealt with for which problem (e.g., PM, ozone or both). | There is significant commonality in the atmospheric processes responsible for ground-level ozone formation and secondary organic aerosol formation. NO _x plays a major role in both as do VOCs. The VOCs of most interest to secondary PM formation are those with 7 or greater carbon atoms, while those that affect ground-level ozone formation also include the lower molecular weight VOCs. It is not currently possible to identify separate classes of VOCs in the context of ozone or secondary PM formation. By dealing with the precursors to PM ₁₀ and the precursors to ozone together, risk management actions will address those precursors which the science shows will result in effective reduction of ozone and/or PM _{2.5} . However, it is important to note that the List of Toxic Substances is just a list; it is the Regulatory Impact Analysis Statement (RIAS) that accompanies the proposed Order that will set out the reasons for each new addition to the List. |
| 11 | NO_x DEFINITION | |
| 11A | For nitrogen oxides, are only NO and NO ₂ addressed by the notice? | The Notice of Intent identifies nitrogen oxides as NO and NO ₂ . Other oxides of nitrogen have small concentrations in the lower troposphere and are not significant reservoirs or are only temporary reservoirs of NO _x , lost through deposition, or conversion to particulate matter. Organic nitrates are expected to deposit or enter particulate matter and are not precursors of ozone. Control of NO and NO ₂ , results in the control of all other nitrogen containing compounds relevant to atmospheric chemistry and ozone formation. |
| 11B | Why is NO categorized as an ozone precursor — because it is a precursor of a precursor? | Both NO and NO ₂ contribute to ozone formation either directly or indirectly. The well understood chemistry of NO _x shows that NO and NO ₂ are in a very fast (time scales of minutes or less) reactive mass exchange from the moment of emission. At night, the absence of photolysis of NO ₂ allows oxidation of NO by ozone: new NO emissions are transformed into NO ₂ ; NO ₂ then contributes to secondary PM formation via nitric acid (HNO ₃) or is photolyzed the next morning. |
| 12 | VOC DEFINITION | |
| 12A | Declaring VOCs toxic, as a class of substances, is not appropriate. Regulatory Policy calls for clear definition of the problem but the definitions of the precursors are too ambiguous. | The addition of a broad class of chemicals to Schedule 1 of CEPA 1999 is appropriate and not unprecedented. For example, polychlorinated dibenzodioxins, polychlorinated dibenzofurans and polychlorinated biphenyls were all added to Schedule 1. Furthermore, Canada and other countries around the world have considered VOCs as a class in managing ozone for many years. VOCs are included as a class in national emission inventories and forecasts, in domestic ozone management plans (e.g. 1990 NO _x /VOC Management Plan, Ontario Anti-Smog Plan), in the Ozone CWS, in various individual control measures (e.g. vehicle emission standards, solvent content limits for products) and in international agreements (e.g. UN ECE VOC Protocol, Ozone Annex to the Canada-U.S. Air Quality Agreement). It is impractical to attempt to manage ozone by dealing individually with each of the contributing VOCs. |
| 12B | The SAD section 2.3.2 provides a clearer definition of VOCs than the Notice of Intent. | The definitions presented in the SAD and the Notice of Intent are consistent, and the latter meets the legal requirements for listing on Schedule 1. |
| 12C | An exclusion list in the definition is not appropriate or legal. The definition of toxic in CEPA compels a listing based on VOCs that enter the environment, not by exclusion. Some VOCs are already listed on Schedule 1. | The proposed wording for the definition of VOCs describes a class of substances, of which a certain number are excluded as they are believed to be a less significant contribution to ozone formation. This in no way modifies other items on the List of Toxic Substances. |
| 12D | VOCs from biogenic sources would be captured under the proposed definition. | The CEPA definition of toxic does not intend to distinguish between biogenic and anthropogenic sources. There are already numerous substances on Schedule 1 that have both natural and anthropogenic sources (e.g., mercury, lead). |

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| 12E | The resulting inclusion of unknown numbers and species of VOCs is scientifically inappropriate. The proposed definition includes VOCs that make no significant contribution to ozone while excluding others that do. The proposal to list all VOCs should be reconsidered in light of substantial scientific evidence that shows that ozone creating potential of individual VOCs is highly variable, not all VOCs are contributors, and some VOCs are ozone scavengers. | All VOCs have the potential to contribute to ozone formation. The proposed definition excludes species that are known to have relatively low potential to contribute to ozone formation. It should also be noted that some VOCs with low OH reactivity with respect to ozone may undergo photolysis, producing a more reactive intermediate. The relative contributions of individual VOCs or VOC classes can only be determined using reactivity scales or air quality modelling specific to the airshed of interest. |
| 12F | Several paraffins whose maximum incremental reactivity (MIR) are less than acetone (excluded from the definition) are not excluded. | The MIRs cited are location and time specific and based on California data; therefore, they are not appropriate to the Canadian situation. These reactivity scales must be applied in the context of the airshed of interest, and the intent with this listing is to provide all regions of Canada with the potential to manage the relevant VOCs. |
| 12G | The Government should adopt the California approach, which prioritized VOCs using MIR and maximum ozone reactivity (MOR). | Prioritization of VOC management is part of the risk management phase. Prioritization based upon reactivity scales can be a valid tool; however, it should be noted that MIR or MOR scales are location and time specific. The applicability of California results for the Canadian environment is by no means guaranteed. |
| 12H | The definition incorrectly includes some VOCs that do not have a significant role because they are not abundant or their reactivity is low. | Low abundance or low reactivity do not, in isolation of each other, determine a VOC's contribution to ozone formation in Canada. For example, a low reactivity compound that is emitted in large quantities may have more of an impact than a high reactivity compound that is emitted in small quantities. Similarly, a single source that has a low abundance on a national scale may have a significant local or regional impact. |
| 12I | VOC exclusions can inadvertently encourage their use and some have high global warming potential. | Excluding certain VOCs from this listing does not preclude their management for other reasons, such as climate change or their own inherent toxicity to human health or the environment. |
| 12J | The SAD states that a ranking scale is a better approach than treating all VOCs equal. | Priorities for action will be established during the risk management phase. |

Referenced Documents

Clean Air Agenda (http://www.ec.gc.ca/air/pdfs/Cleanair_e.pdf)

Interim Plan 2001 on Particulate Matter and Ozone (www.ec.gc.ca/air/pdfs/200104_e.pdf)

NARSTO Ozone Assessment, 2000 (www.cgenv.com/Narsto/)

NOx/VOC Science Assessment, 1996 (www.msc-smc.ec.gc.ca/saib/noxvoc/Summaryeng.pdf)

National Ambient Air Quality Objectives for Ground-Level Ozone Science Assessment Document, 1999 (www.hc-sc.gc.ca/ehp/ehd/catalogue/bch_pubs/ozone.htm)

Priority Substances List Assessment Report for Respirable Particulate Matter Less than or Equal to 10 Microns (www.ec.gc.ca/substances/ese/eng/psap/final/reports/PM-10_fin_e.pdf)