

A Federal Agenda for Reduction of Emissions of Volatile Organic Compounds from Consumer and Commercial Products

Support Document to the Notice of Intent

Transboundary Air Issues Branch
Air Pollution Prevention Directorate
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List of Acronyms and Abbreviations

ACT	Available Control Technology
AIM	Architectural and Industrial Maintenance
AQMD	Air Quality Management District
BARCT	Best Available Retrofit Control Technology
CAAA	Clean Air Act Amendments (US–1990)
CAC	Criteria Air Contaminant
CARB	California Air Resources Board
CCME	Canadian Council of Ministers of the Environment
<i>CEPA</i>	<i>Canadian Environmental Protection Act</i>
CPCA	Canadian Paint and Coatings Association
CTG	Control Techniques Guideline
CWS	Canada-wide Standard
EPA	Environmental Protection Agency (US)
EU	European Union
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
g/L	grams per litre
GVRD	Greater Vancouver Regional District
HAP	hazardous air pollutant
kg	kilogram
L	litre
MACT	Maximum Achievable Control Technology
MD	Maryland (State of)
Mg	megagrams
MMC	Montreal Metro Community
MOU	Memoranda of Understanding
NAAQS	National Ambient Air Quality Standards
NEI	National Emission Inventory (USEPA)
NESHAPs	National Emission Standards for Hazardous Air Pollutants
NOI	Notice of Intent
NO _x	Nitrogen oxides

NPRI	National Pollutant Release Inventory
NSPS	New Source Performance Standards
OEM	Original Equipment Manufacturer
OHAP	organic hazardous air pollutant
OTC	Ozone Transport Commission
OTR	Ozone Transport Region
ppb	parts per billion, where billion = 1×10^9
<i>PCPA</i>	<i>Pest Control Products Act</i>
PEMA	Pollution Emission Management Area
PERC	perchloroethylene
PM	particulate matter
PMRA	Pest Management Regulatory Agency
RACT	Reasonably Available Control Technology
SCAQMD	South Coast Air Quality Management District (California)
SCM	Suggested Control Measure
SIP	State Implementation Plan
TCE	trichloroethylene
TOC	total organic compound
US	United States
USEPA	United States Environmental Protection Agency
VOC	volatile organic compounds
VOHAP	volatile organic hazardous air pollutant
µg	microgram
µm	micrometre

1 Introduction

The purpose of this document is to provide background information and supporting rationale for measures included in the Agenda and published in the *Canada Gazette Part I*, March 27, 2004. This document also includes a summary of stakeholder views and analysis of individual issues.

A comprehensive consultation process on the “Federal Agenda for Reduction of Emissions of Volatile Organic Compounds from Consumer and Commercial Products”, involving all interested parties, was initiated on October 2002.

2 Background

Particulate matter (PM) and ground-level ozone are the main ingredients of smog and cause serious health effects for Canadians, including thousands of premature deaths, hospital admissions and emergency room visits every year. Recent studies have confirmed these negative effects and have shown that air pollution is also associated with an increased risk of lung cancer and heart disease.

Up to two-thirds of fine particulate matter and almost all ground-level ozone are formed in the atmosphere from gaseous precursors. In order to address particulate matter and ground-level ozone, therefore, it is necessary to address the precursors, one of the most important being volatile organic compounds (VOC).

In recognition of the significant adverse human health effects of ground-level ozone and particulate matter, the Government of Canada and the provinces and territories, except Quebec, adopted new Canada-wide Standards (CWSs) for both of these air pollutants. These standards establish ambient target levels to be achieved by 2010: 65 ppb for ozone and 30 $\mu\text{g}/\text{m}^3$ for particulate matter less than 2.5 μm in diameter ($\text{PM}_{2.5}$). Achieving these targets will require significant reductions of PM, ozone, and their precursors, including VOC.

To achieve domestic goals for ozone and fine particulate matter in some areas of Canada, transboundary measures are required to curb air pollution originating in the United States (US). In December 2000, Canada and the US signed an agreement to reduce transboundary air pollution in the form of an Ozone Annex to the 1991 Canada–US Air Quality Agreement. The Ozone Annex commits Canada and the US to take measures to reduce VOC emissions and contains specific commitments to take action to reduce VOC emissions from consumer and commercial products.

Solvents used in many consumer and commercial products constitute a significant source of anthropogenic VOC emissions to the atmosphere. The scope of consumer and commercial products is very broad and includes not only household products but many products used commercially and in industrial operations. This vast universe of products ranges from underarm antiperspirants—to exterior paints used on homes—to inks used in commercial printing—to degreasing agents. Individually, these are small sources, but in total they contribute significantly to the overall atmospheric loadings of VOC and the associated ozone and particulate matter problem.

The Government of Canada’s “Interim Plan 2001 on Particulate Matter and Ozone” includes a commitment to develop an action plan to reduce VOC emissions from products. The \$120 million package for clean air initiatives announced in the budget of February 2001 included resources for developing and implementing this plan. Additional resources for work on VOC-containing products were included under the \$40 million for clean air provided in the budget of February 2003.

In October 2002, Environment Canada initiated consultations on the Federal Agenda by meeting with key stakeholder groups to ensure awareness of the government’s intention to

develop an action plan for consumer and commercial products and to encourage participation in the consultation process on proposed measures. To facilitate stakeholder participation, a discussion document entitled “Future Canadian Measures for Reducing Emissions of Volatile Organic Compounds (VOC) from Consumer and Commercial Products” was developed to provide background on various issues and describe proposed actions that would serve as the basis for consultations (Web site address).

In February 2003, Environment Canada distributed the discussion document to stakeholders, along with an invitation to a March 2003 consultation workshop. Over 55 representatives of industry, environmental and health groups, municipalities, and federal and provincial governments attended the workshop. All parties were invited to make presentations at the workshop and to provide written submissions outlining their views on the proposed actions. A workshop report was prepared describing the major comments, points of view, and proposals of participants. This report was distributed to all interested stakeholders (www.ec.gc.ca/nopp/voc/en/index.cfm). Environment Canada offered to meet with stakeholders on a bilateral basis following the workshop to further discuss their views; some industry representatives arranged meetings for this purpose.

Following a thorough review and full consideration of stakeholder comments, the Minister of the Environment and the Minister of Health have developed a federal agenda of planned measures and future initiatives to reduce emissions of VOC from consumer and commercial products. The Ministers have published a summary of the planned Agenda measures and associated timelines for implementation in the *Canada Gazette Part I* (March 27, 2004). Initiatives set out in the Agenda, most importantly regulation development, will be undertaken following established processes. This will include consultation with stakeholders.

The Federal Agenda addressing VOC emissions from products is a key element of the federal government’s clean air strategy. Other elements include the measures outlined in the “Federal Agenda on Cleaner Vehicles, Engines and Fuels”, working with the provinces and territories to achieve the Canada-wide Standards for particulate matter and ground-level ozone by 2010, development of strategies to address key industrial sectors, and implementing an Ozone Annex with the US to reduce transboundary air pollution.

3 Volatile Organic Compounds and Air Pollution

3.1 Characterizing Volatile Organic Compounds

For the purposes of the Agenda, VOC are those compounds consistent with the definition used in Schedule 1 to the *Canadian Environmental Protection Act 1999 (CEPA, 1999)* (*Canada Gazette, Part II*, July 2, 2003, p. 1864).

“volatile organic compounds that participate in atmospheric photochemical reactions, excluding the following:

- (a) methane;
- (b) ethane;
- (c) methylene chloride (dichloromethane);
- (d) 1,1,1-trichloroethane (methyl chloroform);
- (e) 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113);
- (f) trichlorofluoromethane (CFC-11);
- (g) dichlorodifluoromethane (CFC-12);
- (h) chlorodifluoromethane (HCFC-22);
- (i) trifluoromethane (HFC-23);
- (j) 1,2-dichloro-1,1,2,2-tetrafluoroethane (CFC-114);
- (k) chloropentafluoroethane (CFC-115);
- (l) 1,1,1-trifluoro-2,2-dichloroethane (HCFC-123);
- (m) 1,1,1,2-tetrafluoroethane (HFC-134a);
- (n) 1,1-dichloro-1-fluoroethane (HCFC-141b);
- (o) 1-chloro-1,1-difluoroethane (HCFC-142b);
- (p) 2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124);
- (q) pentafluoroethane (HFC-125);
- (r) 1,1,2,2-tetrafluoroethane (HFC-134);
- (s) 1,1,1-trifluoroethane (HFC-143a);
- (t) 1,1-difluoroethane (HFC-152a);
- (u) perchlorobenzotrifluoride (PCBTF);
- (v) cyclic, branched or linear completely methylated siloxanes;
- (w) acetone;
- (x) perchloroethylene (tetrachloroethylene);
- (y) 3,3-dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca);
- (z) 1,3-dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb);
- (z.1) 1,1,1,2,3,4,4,5,5,5-decafluoropentane (HFC 43-10mee);
- (z.2) difluoromethane (HFC-32);
- (z.3) ethylfluoride (HFC-161);
- (z.4) 1,1,1,3,3,3-hexafluoropropane (HFC-236fa);
- (z.5) 1,1,2,2,3-pentafluoropropane (HFC-245ca);
- (z.6) 1,1,2,3,3-pentafluoropropane (HFC-245ea);
- (z.7) 1,1,1,2,3-pentafluoropropane (HFC-245eb);
- (z.8) 1,1,1,3,3-pentafluoropropane (HFC-245fa);
- (z.9) 1,1,1,2,3,3-hexafluoropropane (HFC-236ea);
- (z.10) 1,1,1,3,3-pentafluorobutane (HFC-365mfc);
- (z.11) chlorofluoromethane (HCFC-31);

- (z.12) 1-chloro-1-fluoroethane (HCFC-151a);
- (z.13) 1,2-dichloro-1,1,2-trifluoroethane (HCFC-123a);
- (z.14) 1,1,1,2,2,3,3,4,4-nonafluoro-4-methoxy-butane (C₄F₉OCH₃);
- (z.15) 2-(difluoromethoxymethyl)-1,1,1,2,3,3,3-heptafluoropropane [(CF₃)₂CF₂OCH₃];
- (z.16) 1-ethoxy-1,1,2,2,3,3,4,4,4-nonafluorobutane (C₄F₉OC₂H₅);
- (z.17) 2-(ethoxydifluoromethyl)-1,1,1,2,3,3,3-heptafluoropropane [(CF₃)₂CF₂OC₂H₅];
and
- (z.18) methyl acetate and perfluorocarbon compounds that fall into the following classes:
 - (i) cyclic, branched or linear completely fluorinated alkanes,
 - (ii) cyclic, branched, or linear completely fluorinated ethers with no unsaturations,
 - (iii) cyclic, branched or linear completely fluorinated tertiary amines with no unsaturations, and
 - (iv) sulfur containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine.”

3.2 Major Sources

Volatile organic compound emissions originate from anthropogenic and natural sources. In more populated and industrialized areas, however, anthropogenic emissions predominate with densities often orders of magnitude higher than those attributed to natural sources. Major contributors to anthropogenic VOC emissions are the transportation sector, industrial sources, and the use of solvent-containing products.

Emissions of VOC from upstream oil and gas and residential wood combustion can also be significant; however, care is required in considering their contributions to the overall national emissions picture. Upstream oil and gas emissions are quite localized, representing the primary VOC source in areas of oil and gas production, but not constituting a significant source outside these areas. Residential wood combustion is seasonal, with contributions from this source occurring primarily during fall and winter.

3.3 Consumer and Commercial Products

The focus of the Agenda is on potential measures to reduce VOC emissions from solvent-containing consumer and commercial products. The scope of consumer and commercial products is very broad and includes not only household consumer products but many products used commercially and in industrial manufacturing operations. This vast universe of products ranges from underarm antiperspirant deodorants to coatings used in the manufacture of automobiles, to inks used in commercial printing. (Solvent-containing consumer and commercial products do not include fuels, fuel additives, motor vehicles, non-road vehicles, and non-road engines.)

A number of jurisdictions, particularly in the US (at both the federal and State levels) have imposed mandatory limits for VOC content for particular categories of consumer and commercial products. This has resulted in considerable reduction in the emissions of VOC. In some instances, however, it may be as effective and more efficient to reduce VOC emissions from products by directing efforts at the end-use. An end-use approach may be particularly appropriate where the population of the end-users is limited and readily identifiable.

3.4 Sources of Volatile Organic Compound Emissions

The national criteria air contaminants (CAC) inventory (1995) identifies a total of 2429 kilotonnes (kt) of VOC emissions for Canada with the most significant sources being transport (31%), upstream oil and gas (28%), solvent use (19%), industrial sources (10%), residential/commercial fuel/wood combustion (6%), and fuel marketing (4%) (CAC Division, Pollution Data Branch, latest emissions inventory and trends).

Of these sources, “upstream oil and gas” is primarily a regional issue, representing the dominant VOC source in Alberta and a significant source in Saskatchewan. However, in other areas of the country, and in particular those areas most affected by ground-level ozone and PM, upstream oil and gas is not a significant contributor. Consequently, it is useful to examine the national VOC emission picture without the upstream oil and gas contribution on the premise that this profile will be more indicative of contributing VOC sources for most of the country. With this adjustment, total emissions are 1740 kt for 1995; transportation at 43% continues to be the most significant source; solvent use (28%) is the second largest, followed by industrial sources, residential/commercial fuel/wood combustion, and fuel marketing (Figure 1).

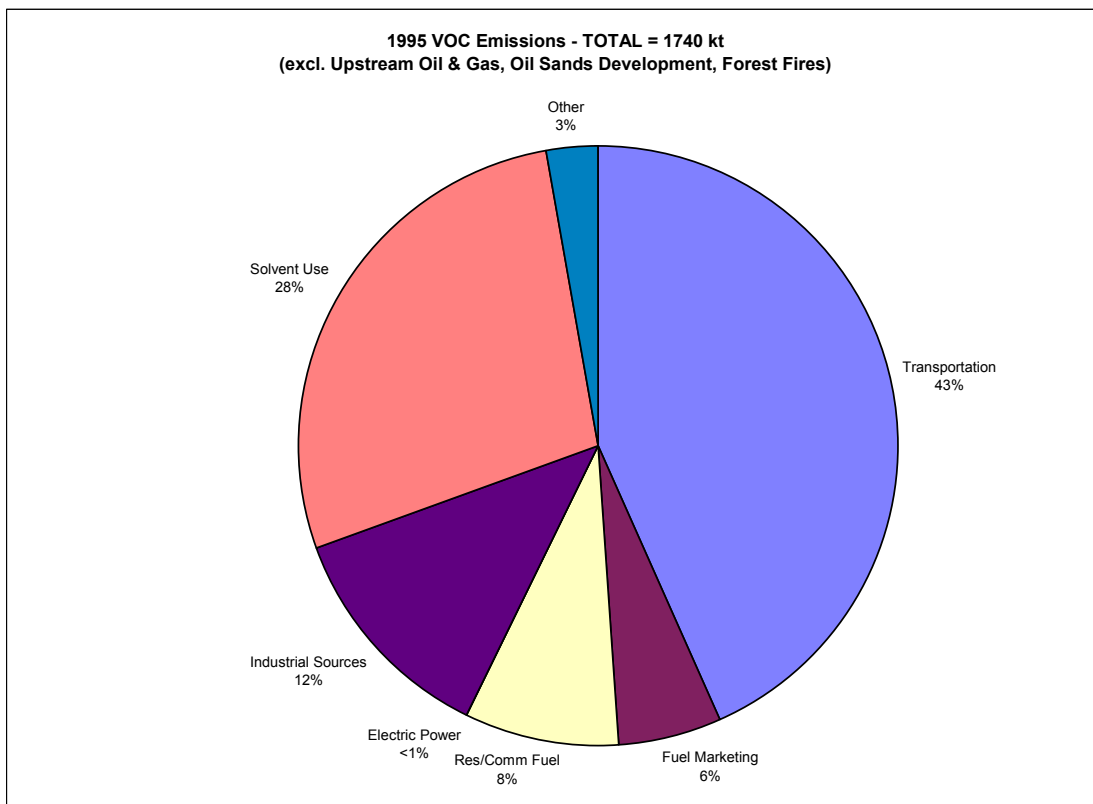


Figure 1 1995 VOC Emissions

Implementation of measures under the “Federal Agenda on Cleaner Vehicles, Engines and Fuels” will achieve substantial VOC reductions from the transportation sector by 2010. Reflecting the success of this program, forecasts for 2010 (Figure 2) indicate that solvent

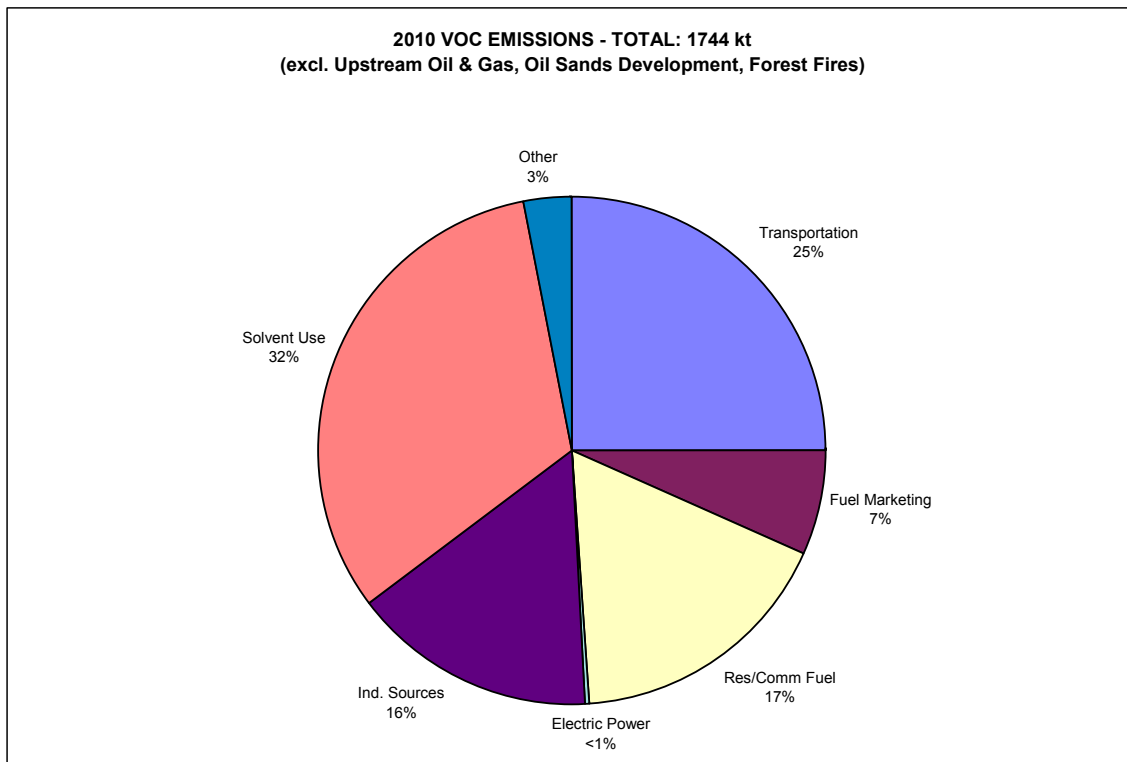


Figure 2 2010 VOC Emissions

use will have replaced transportation as the largest source of anthropogenic VOC emissions in Canada accounting for 32%, compared to 25% for transportation.

3.5 Emissions of Volatile Organic Compounds from Consumer and Commercial Products

The “solvent use” component of the 1995 CAC Inventory addresses emissions of VOC from consumer and commercial products. Characterization of this component in terms of product sectors indicates that major sources and their respective contributors are:

Source Sector	VOC Emissions (%)
Paints and Coatings	45
Consumer Products	27
Industrial Non-process	9
Printing	8
Commercial/Industrial Cleaning	5
Degreasing	4
Pesticides	2
Dry Cleaning	<1

This inventory information indicates that “paints and coatings” and “consumer products” are the predominant sector contributors.

4 Situation in Canada

4.1 *Joint Federal/Provincial/Territorial Measures*

Measures developed jointly by the federal government, provinces, and territories to reduce VOC emissions from the solvent-use sector are in the form of environmental codes, guidelines, standards, and Memoranda of Understanding (MOUs) issued by the Canadian Council of Ministers of the Environment (CCME). These measures stemmed from the 1990 CCME Phase 1 NO_x/VOC Management Plan.

Many of the codes, guidelines, and standards developed through this process dealt with both new and existing emission sources. In such cases, the instrument usually notes that the new source measures are intended for widespread application across Canada and that implementation of the existing source measures may be more regionally targeted, focusing on ozone problem areas, specifically the Lower Fraser Valley of British Columbia; the Windsor-Quebec Corridor of southern Ontario and southern Quebec; and the Southern Atlantic Region encompassing the southwestern portions of the provinces of New Brunswick and Nova Scotia.

Some codes, guidelines, or standards for the solvent-use sector contain both VOC content limits for products used and equipment, facility, and operational requirements, often for both new and existing sources.

There are 13 codes, guidelines, standards, or MOUs for solvent-use subsectors that have been completed and endorsed by the CCME. These are listed below in order of publication year.

1. Environmental Code of Practice for Reduction of Solvent Emissions from Dry Cleaning Facilities, December 1992, PN 1053
2. A Plan to Reduce VOC Emissions by 20 percent from Consumer Surface Coatings, March 1994, PN 1114
3. A Program to Reduce VOC Emissions by 40 percent from Adhesives and Sealants, March 1994, PN 1116
4. Environmental Code of Practice for the Reduction of Solvent Emissions from Commercial and Industrial Degreasing Facilities, June 1995, PN 1182
5. MOU between CCME, Environment Canada and the Canadian Paint and Coatings Association (CPCA) Respecting the Annual Reporting of the Volume of VOC Contained in Consumer Paint Sold in Canada, 1995
6. New Source Performance Standards and Guidelines for the Reduction of VOC Emissions from Canadian Automotive OEM Coating Facilities, August 1995, PN 1234

7. Environmental Guideline for the Reduction of VOC Emissions from the Plastics Processing Industry, July 1997, PN 1276
8. National Standards for the VOC Content of Canadian Commercial/Industrial Surface Coating Products – Automotive Refinishing, October 1998, PN 1288
9. National Standards and Guidelines for the Reduction of VOC from Canadian Commercial/Industrial Surface Coating Operations – Automotive Refinishing, October 1998, PN 1278
10. Environmental Code of Practice for the Reduction of VOC Emissions from the Commercial/Industrial Printing Industry, August 1999, PN 1301
11. Standards and Guidelines for the Reduction of VOC Emissions from Canadian Automotive Parts Coatings Operations, October 2001, PN 1318
12. Standards and Guidelines for the Reduction of VOC Emissions from Canadian Industrial Maintenance Coatings, October 2001, PN 1320
13. Guidelines for the Reduction of VOC Emissions in the Wood Furniture Manufacturing Sector, 2004, PN 1336

Although some implementation of the codes and guidelines is assumed to be taking place, it is difficult to estimate the overall extent. Utilization for new sources subject to environmental assessment or permitting requirements may be fairly common. At present, no tracking mechanism is in place to provide an estimate of implementation.

4.2 Measures by the Federal Government

In addition to its involvement in joint initiatives with the provinces/territories, the federal government has several measures in place or under development that should either directly or indirectly result in VOC emission reductions in the solvent-use sector. These include:

1. *CEPA 1999* Guidelines for Volatile Organic Compounds in Consumer Products (*Canada Gazette, Part I*, Nov. 23, 2002, p. 3460)
2. *CEPA 1999* Regulation for Solvent Degreasing (*Canada Gazette, Part II*, Aug. 13, 2003). (This regulation is noted for its reference to trichloroethylene. Tetrachloroethylene, the other solvent addressed, is excluded from the proposed definition of VOC.)

The *CEPA 1999* Guideline for VOC in Consumer Products is modeled after the Consumer Products Regulation under the US Clean Air Act Section 183(e) and contains VOC content limits for 22 consumer product types (of the 24 addressed by the US regulation) including such products as hairsprays, household cleaning products, automobile cleaning products, and insecticides.

Environment Canada's Environmental Choice Program encourages the supply of and demand for products and services that are more environmentally responsible. To obtain environmental certification of their products/services, companies must comply with stringent

environmental criteria that are established in consultation with industry, environmental groups, and independent experts and are based on research into the life-cycle impacts of a product or service. The Environmental Choice Program currently sets VOC content limits for the following products: consumer, industrial and/or institutional cleaning products, biologically based cleaning and degreasing compounds, industrial hand cleaners, paints, surface coatings, printing inks, adhesives, and personal care products.

4.3 Measures by Provinces/Territories

Provinces/territories have developed or are developing measures that will directly or indirectly result in some reductions in VOC emissions from the solvent-use sector. These include:

- operating permits for solvent-use subsectors under provincial/territorial legislation;
- ozone episode alert or advisory programs that may influence short-term personal use of solvent-containing products (e.g., Ontario, New Brunswick); and
- specific provincial/territorial air pollutant reduction measures in place or planned that are applicable to solvent-use subsectors (e.g., dry cleaning, degreasing, asphalt production).

Some provinces/territories are including some or all provisions of certain CCME codes, guidelines, or standards in facility-operating permits. Provincial/territorial permits, however, tend to be used for larger emitting sources and may not provide good coverage for solvent-use subsectors that have many small facilities. Also, it is unlikely that many existing permits for solvent-use facilities actually contain VOC reduction provisions.

4.4 Measures by Municipalities

Some municipalities across Canada have been active in developing measures to help reduce VOC emissions from the solvent-use sector. Two municipalities in particular, the Greater Vancouver Regional District (GVRD) and the City of Montreal, have a number of VOC emission management measures for solvent-use subsectors in place or planned.

4.5 Summary

Overall, there has been considerable effort by jurisdictions to develop codes, guidelines, and standards that provide sound technical guidance for control strategies. Use of these instruments for development and implementation of measures to reduce VOC emissions, however, has not been extensive. Volatile organic compound emissions from consumer and commercial products are expected to continue to increase despite current efforts at the federal, provincial, territorial, and municipal levels.

5 Situation in the United States

5.1 General Overview

A series of measures are in place in the US to reduce VOC emissions from the solvent-use sector. These exist at the national (federal) level, in different regional contexts and within individual States. The primary driver for these measures is the US National Ambient Air Quality Standard (NAAQS) for ground-level ozone (see page 31). It has been recognized for some time that reductions in VOC emissions are needed to meet the Ozone NAAQS in many of the areas across the US where meeting the standard is a challenge.

Some of the more severe ozone non-attainment conditions in the US exist in California and in the northeastern states. This has stimulated California to lead the way with some of the most aggressive VOC reduction programs for the solvent-use sector as well as other VOC-emitting sectors. It also led to designation of the Ozone Transport Region (OTR) in the US Clean Air Act Amendments (CAAA) of 1990 to address ozone non-attainment problems associated with transport of ozone between States. The OTR includes 12 states in the US northeast plus the District of Columbia. The Ozone Transport Commission (OTC) was created by Congress in 1990 to help develop solutions to the ozone transport problem in the OTR.

An even larger ozone transport region was later established in the northeastern and mid-western US involving 22 states including 12 of the 13 jurisdictions that are part of the OTR. These States make up the US portion of the transboundary Pollution Emission Management Area (PEMA) designated in the Ozone Annex to the 1991 Canada–US Air Quality Agreement. In signing the Ozone Annex in December, 2000, Canada and the US have formally recognized their respective PEMAs as the most important source regions for VOC and NO_x emissions that contribute to the transboundary flow of ozone and its precursors between the two countries. Ozone attainment needs have led to consideration of more stringent measures for reducing solvent sector VOC emissions in many of the OTR and PEMA states than elsewhere in the US.

The distribution of VOC emissions among all contributing source sectors in the US in 1999 indicates the solvent-use sector as the second largest, contributing approximately 27% of the US national VOC inventory compared to 47% from transportation, the largest contributing sector (Table 1).

Within the solvent-use sector, VOC emissions are distributed among various subcategories (Table 2).

In the Ozone Annex, the US has estimated that the VOC reduction measures it intends to implement will reduce annual VOC emissions in its PEMA from 1990 levels by 35% in 2007, and 38% in 2010. The largest percent reductions are anticipated to come from the transportation sector (72% reduction in emissions from highway vehicles, 36% reduction in emissions from off-highway vehicles), and waste disposal/recycling (69% decrease in emissions). Solvent use is predicted to decrease by 7%. Some States within the PEMA

Table 1 Distribution of VOC Emissions Among all Contributing Source Sectors in the United States (1999)

Source Category	Short tons (H1000)	Percent of Total (%)
Transportation	8529	47.0
Solvent Use	4825	26.6
Industrial Processes	1345	7.4
Storage and Transport	1240	6.8
Fuel Combustion	904	5.0
Miscellaneous	716	3.9
Waste Disposal and Recycling	586	3.2

Table 2 VOC Emissions Among Subcategories of the Solvent-use Sector in the United States (1999)

Source Category	Short tons (H 1000)	Percent of Total (%)
Surface Coatings (includes industrial adhesives)	2137	44.3
Consumer Products (includes non-industrial adhesives)	1133	23.4
Pesticide Application	412	8.5
Degreasing	371	7.7
Graphic Arts	292	6.1
Asphalt (cutback and other)	193	4.0
Other Industrial and Non-industrial	120	2.5
Dry Cleaning (total)	168	3.5
(Perchloroethylene)	(63)	
(Naphtha)	(97)	
(Other)	(8)	

anticipate achieving more robust reductions in the solvent sector, with Michigan, Ohio, New York, and Pennsylvania projecting reductions in the range of 17%.

5.2 Overview of Regulatory Programs Affecting the Solvent Sector

Federal Programs

Most of the US regulatory effort affecting the solvent sector has occurred following the 1990 Clean Air Act Amendments (CAAA). Under Section 183(e) of the 1990 US CAAA, the USEPA was required to conduct a study of the role of VOC emissions from consumer and commercial products in ozone formation. Categories of products were to be listed in four groups accounting for at least 80% of the VOC from consumer and commercial products in ozone non-attainment areas, and one group was to be regulated every two years until all four groups were regulated (Table 3). To date, this has resulted in the promulgation in 1998 of

three separate regulations for (i) consumer products; (ii) architectural coatings; and (iii) automobile refinish coatings. The USEPA has the option of developing a Control Techniques Guideline (CTG) instead of a national regulation where such action would be as effective as a regulation in reducing emissions of VOC in ozone non-attainment areas. A CTG would trigger the need for States with ozone non-attainment areas to develop their own state or local rules. The CTG approach has been used by the USEPA to address a number of sectors identified for VOC control (e.g., shipbuilding and ship-repair coatings, aerospace coatings, wood furniture coatings). Resource pressures, however, have resulted in the USEPA being unable to meet the original schedule for implementation of control strategies for all specified product categories, with a significant number pending a decision.

In addition to the CAAA Section 183(e) requirements, the USEPA was also required to establish maximum achievable control technology (MACT) standards for several solvent subsectors under Section 112 of the CAAA. Maximum achievable control technology standards are also referred to as national emission standards for hazardous air pollutants (NESHAPs) and are designed to control emissions of hazardous air pollutants (HAPs) designated under the Act. The USEPA is actively developing emission standards in a coordinated fashion to satisfy the requirements of both Sections 183(e) and 112. Many of the NESHAPs will reduce mass VOC emissions as well as HAP emissions; indeed for some of the categories the HAPs of concern are primarily VOC.

Local Programs

Analysis in recent years has determined that, even with the numerous federal rules in place and planned, for the solvent-use sector and for other VOC source sectors (transportation, industrial point sources, etc.), shortfalls will still be experienced in meeting the ozone NAAQS in some of the more severe ozone non-attainment areas across the US. These shortfalls are predicted to become even more widespread when the US moves from the 1-hour ozone NAAQS to the new 8-hour NAAQS. Certain regions and/or States have looked at additional measures to reduce VOC emissions from solvent sector categories in an attempt to make up these shortfalls.

Local programs include those developed by regional planning organizations (groups of States with common air quality goals), individual states, and local air quality management agencies. In the US, California has led the nation in developing regulations to reduce VOC emissions beyond those required by the federal programs mentioned previously.

Recently, the OTC developed several model rules covering solvent subsectors (e.g., solvent cleaning, architectural and industrial maintenance coatings, consumer products, auto refinishing). Member States of the OTC are now in the process of adopting these rules, some of which are based on California programs.

Table 3 Consumer and Commercial Products Schedule for Regulations by the USEPA (Revised Schedule of March 18, 1999)

	Schedule for regulation (year)
Group I	
Consumer products (24 categories)*	1997
Shipbuilding and repair coatings	1997
Aerospace coatings	1997
Architectural coatings	1997
Autobody refinishing coatings	1997
Wood furniture coatings	1997
Group II	
Flexible package printing materials	1999
Group III	
Aerosol spray paints	2001
Industrial cleaning solvents	2001
Flat wood paneling coating	2001
Lithographic printing materials	2001
Group IV	
Paper, film, and foil coating	2003
Letterpress printing materials	2003
Plastic parts coatings	2003
Metal furniture coatings	2003
Auto and light-truck assembly coatings	2003
Petroleum dry-cleaning solvents	2003
Miscellaneous metal products coating	2003
Large appliance coatings	2003
Fiberglass boat manufacturing materials	2003
Miscellaneous industrial adhesives	2003

* Product categories included in "Consumer Products (24 categories)" grouping: aerosol cooking sprays, air fresheners, auto windshield-washer fluids, bathroom and tile cleaners, carburetor and choke cleaners, charcoal lighter materials, dusting aids, engine degreasers, fabric protectants, floor waxes and polishes, furniture maintenance products, general purpose cleaners, glass cleaners, hair sprays, hair mousses, hair-styling gels, household adhesives, non-agricultural insecticides, laundry pre-wash treatments, laundry starch products, nail polish removers, oven cleaners, shaving creams, and underarm antiperspirants and deodorants.

5.3 Description of Specific Programs

5.3.1 Overview

There are two basic categories of solvent sector VOC control measures in the US.

- (a) Measures that limit the VOC content of consumer and commercial products. This approach is most often utilized in instances where the use of the product is dispersive and control/capture at the point of end use is not feasible or practical. The USEPA has

promulgated three national rules for consumer and commercial products under Section 183(e) of the CAAA:

- (i) National VOC Emission Standards for Consumer Products, Sept. 11, 1998
- (ii) National VOC Emission Standards for Architectural Coatings, Sept. 11, 1998
- (iii) National VOC Emission Standards for Auto Refinish Coatings, Sept. 11, 1998

Product limitation measures for these and other solvent-use categories also exist at the state and regional level.

- (b) Measures that apply to solvent-use facilities and operations. The federal measures for reducing VOC emissions from solvent-use facilities are primarily in the form of Control Techniques Guidelines (CTGs) or guidance on Available Control Technology (ACT). Emission control requirements established by States for solvent sector facilities and operations are often based on these federally developed CTGs and ACTs.

The following section provides a brief description of VOC reduction measures at the national and state/regional levels in the US for major solvent sector categories.

5.3.2 Consumer Products

This product category is made up primarily of personal care products, household products including automobile aftermarket products, consumer adhesives and sealants, and pesticides used around the home. It does not include consumer surface coatings, which are included in the surface coating category.

The US control measures for VOC from consumer products include:

- National VOC Emission Standards for Consumer Products, Sept. 11, 1998
- OTC Model Rule for Consumer Products, March 28, 2001

The national Consumer Products rule contains VOC content limits for 24 product categories representing 48% of the consumer products inventory. The OTC Consumer Products rule based on the Consumer Products rule of the California Air Resources Board (CARB), addresses a broader list of products and tightens the VOC content limits for some of the product categories in the national rule.

Table 4 provides a list of the product categories and VOC content limits for both the national rule and the OTC model rule.

5.3.3 Surface Coating

Actions to reduce VOC emissions from the surface-coating sector category include measures that establish VOC limits for a wide range of surface-coating products and measures that apply to various types of surface-coating facilities and operations.

Table 4 VOC Content Limits for Consumer Products—US National Rule and OTC Model Rule

Product	VOC CONTENT LIMITS (wt % VOC)	
	US National	OTC
A. Personal Care Products		
1. Hair Care		
• Hairsprays	80	55
• Hair Mousses	16	6
• Hair Styling Gels	6	6
• Hair Shines	--	55
2. Deodorants and Antiperspirants		
• Antiperspirants - aerosol	60	40
• Deodorants - aerosol	20	10
3. Miscellaneous Personal Care Products		
• Shaving Creams	5	5
• Nail Polish Removers	85	75
• Heavy Duty Hand Cleaner or Soap	--	8
• Fragrance Products	--	--
B. Cleaning and Maintenance Products		
1. Auto		
• Carburetors and Choke Cleaners	75	45
• Engine Degreasers (aerosol and non-aerosol)	75	35/5
• Brake Cleaners	--	45
• Auto Rubbing and Polishing Compounds	--	17
• Auto Wax, Polish, Sealant or Glaze		
Hard Paste Waxes	--	45
Instant Detailers	--	3
All Other Forms	--	15
• Auto Adhesives		
Mounting	--	70
Foam and Headliner	--	65
Repair/Edgebanding	--	60
Repair/Edgebanding	--	20
• Tire Sealants and Inflators		
• Rubber and Vinyl Protectants		
Aerosol	--	10
Non-aerosol	--	3
• Undercoatings – Aerosol	--	40
• Bug and Tar Removers	--	40
• Windshield Washer Fluid	35	35
2. Air Fresheners		
• Single-Phase	70	30
• Double-Phase	30	25
• Liquids/Pump Sprays	18	18
• Solids/Gels	3	3
3. Laundry Products		
• Pre-wash Aerosols/Solids	22	22
• Pre-wash – All Other Forms	5	5
• Starch Products	5	5

4. Floor Polishes/Waxes		
• Products for Flexible Flooring	7	7
• Products for Non-resilient Flooring	10	10
• Wood Floor Wax	90	90
5. Furniture Maintenance Products		
• Aerosol	25	17
• All Other Forms	--	7
6. Fabric and Carpet Care		
• Cleaners – Aerosols	--	7
- Non-aerosol (dilutables)	--	0.1
- Non-aerosol (ready-to-use)	--	3.0
• Fabric Protectants	75	60
7. General Purpose Cleaners		
• Aerosol	10	10
• Non-aerosol	--	4
8. General Purpose Degreasers		
• Aerosol	--	50
• Non-aerosol	--	4
9. Bathroom and Tile Cleaners		
• Aerosol	7	7
• Non-aerosol	5	5
10. Glass Cleaners		
• Aerosol	12	12
• All Other Forms	8	4
11. Oven Cleaners		
• Aerosol/Pump Sprays	8	8
• Liquids	5	5
12. Dusting Aids		
• Aerosols	35	25
• All Other Forms	7	7
13. Spot Removers		
• Aerosols	--	25
• Non-aerosols	--	8
14. Metal Polishes/Cleaners	--	30
15. Household Adhesives		
• Aerosols	75	65
• Contact	80	80
• Construction and Panel	40	15
• General Purpose	10	10
• Structural Waterproof	15	15
16. Sealants and Caulking Compounds	--	4
17. Lubricants		
• Multi-purpose (Excluding Solid/Semi-solid)	--	50
• Silicone-based (Excluding Solid/Semi-solid)	--	60
18. Penetrants	--	50
19. Paint Remover and Strippers	--	50
C. Pesticides/Herbicides/Fungicides		
1. Insecticides		
• Crawling Bug	40	15 (aerosol) 20 (all other)
• Flea and Tick	25	25
• Flying Bug	35	25 (aerosol) 35 (all other)
• Foggers	45	45
• Lawn and Garden	20	3 (aerosol) 20 (all other)
• Wasp and Hornet	--	40

2. Herbicides • Non-Selective Terrestrial – Non-Aerosol	--	3
D. Other/Miscellaneous		
1. Cooking Sprays - Aerosol	18	18
2. Charcoal Lighter Fluid	9 g/start	

5.3.3.1 Measures Limiting VOC Content of Products. Measures in the US to limit the VOC content of surface-coating products address two primary categories: architectural and industrial maintenance (AIM) coatings, and automobile refinish coatings.

AIM Surface-coating Products. Architectural surface coatings provide protection from corrosion, decay, ultraviolet light damage, and/or penetration of water. They include paint, paint primer, varnish, or lacquer applied to architectural surfaces. Industrial maintenance coatings are coatings applied to structures such as bridges, highways, railroads, sewer and water plants, factories, and utilities. Volatile organic compounds are emitted from AIM coatings during coating application and when the coatings dry.

The US control measures for limiting the VOC content of AIM coating products include:

- National VOC Emission Standards for Architectural Coatings, Sept. 11, 1998
- OTC Model Rule for AIM Coatings, March 6, 2001

The OTC model rule established more stringent VOC content limits than those established in the federal rule and is based on a similar rule of the California Air Resource Board.

Table 5 provides a list of the product categories and VOC content limits for both the national rule and the OTC model rule for AIM surface-coating products.

Automobile Refinish Surface-coating Products. This surface-coating category refers to coatings applied during the repair or re-painting of vehicles and does not include coating applications by original equipment manufacturers. Coatings may include a pre-treatment wash primer or precoat, a primer surfacer, a primer sealer, and a single-stage, two-stage (basecoat, clearcoat) or three-stage (basecoat, midcoat, clearcoat) topcoat. Emissions occur during surface preparation, coating application, and cleanup.

The US control measures for limiting the VOC content of auto refinish coating products include:

- National VOC Emission Standards for Auto Refinish Coatings, Sept. 11, 1998
- OTC Mobile Equipment Repair and Refinishing Rule, March 6, 2001

Table 5 VOC Content Limits for Architectural and Industrial Maintenance Surface-coating Products—US National Rule and OTC Model Rule

Product	VOC CONTENT LIMITS (g/L of coating)	
	US National	OTC
Antenna coatings	530	530
Anti-fouling coatings	450	400
Anti-graffiti coatings	600	250
Bituminous coatings and mastics	500	300/350
Bond breakers	600	350
Calcimine recoater	475	
Chalkboard resurfacers	450	250
Concrete curing compounds	350	350
Concrete curing and sealing compounds	700	
Concrete protective coatings	400	
Concrete surface retarders	780	
Conversion varnish	725	
Dry fog coatings	400	400
Extreme high durability coatings	800	250
Faux finishing/glazing	700	350
Fire-retardant/resistive coatings: clear	850	650
opaque	450	350
Flat coatings		
Exterior coatings	250	100
Interior coatings	250	100
Floor coatings	400	250
Flow coatings	650	420
Form release compounds	450	250
Graphic arts coatings (sign paints)	500	500
Heat reactive coatings	420	420
High temperature coatings	650	420
Impacted immersion coatings	780	250
Industrial maintenance coatings	450	250
Lacquers (including lacquer sanding sealers)	680	550
Magnesite cement coatings	600	450
Mastic texture coatings	300	300
Metallic pigmented coatings	500	500
Multi-coloured coatings	580	250
Nonferrous ornamental metal lacquers and surface protectants	870	250
Nonflat coatings		
Exterior coatings	380	150
Interior coatings	380	150
Nuclear coatings	450	250
Pretreatment wash primers	780	420
Primers and undercoaters	350	200
Quick-dry coatings		
Enamels	450	250
Primers, sealers, and undercoaters	450	200
Repair and maintenance thermoplastic coatings	650	250
Roof coatings	250	250
Rust preventative coatings	400	400
Sanding sealers (other than lacquer sealers)	550	350
Sealers (including interior clear wood sealers)	400	200

Shellacs		
Clear	730	730
Opaque	550	550
Stains		
Clear and semitransparent	550	250
Opaque	350	250
Low solids	120	120
Stain controllers	720	--
Swimming pool coatings	600	340
Thermoplastic rubber coatings and mastics	550	250
Traffic marking coatings	150	150
Varnishes	450	350
Waterproof sealers and treatments	600	400/250
Wood preservatives		
Below ground wood preservatives	550	350
Clear and semitransparent	550	350
Opaque	350	350
Low solids	120	--
Zone marking coatings	450	--

The OTC model rule has the same VOC content limits as the federal rule except for slightly more stringent limits for primer/surfacer coatings and three or four-stage topcoats.

Table 6 provides a list of the product categories and VOC content limits for both the national rule and the OTC model rule for automotive refinish surface-coating products.

Table 6 VOC Content Limits for Automotive Refinish Surface-coating Products—US National Rule and OTC Model Rule

Product	VOC CONTENT LIMITS (g/L of coating)	
	US National	OTC Model
Pretreatment wash primer	780	780
Primer/primer surfacer	580	575
Primer sealer	550	550
Topcoats:		
Single stage topcoat	600	600
Two-stage basecoat/topcoat	600	600
Three or more stage basecoat/clearcoat	630	625
Multi-coloured	680	680
Specialty coatings	840	840

5.3.3.2 Measures Applicable to Facilities and Operations. Various measures to reduce VOC emissions from AIM Coatings have been developed, at both the federal and state levels, for implementation at facilities and/or operations. Various emission reduction strategies are used, including VOC emission limits for the facility/operation based on control

technology capability, VOC content limits for products at the facility/operation, and work practice standards.

Since 1990, VOC reductions have been addressed primarily through Control Technique Guidelines (CTGs) (e.g., shipbuilding and ship-repair coatings, aerospace coatings, wood furniture coatings) and a number of NESHAPs which, while targeting HAP emission reductions, also provide commensurate reductions in VOC that contribute to ozone formation. The NESHAPs of particular relevance to surface-coating categories identified for VOC control are those pertaining to: automobile and light-duty truck coating and manufacture, boat manufacturing, metal furniture surface coating, large appliances, miscellaneous metal parts and products, and fabric coating, printing, and dyeing. In keeping with USEPA's commitment to consistency in regard to measures dealing with surface coatings under Section 112 and 183e of the CAAA, it is anticipated that controls for mass VOC will be similar to NESHAPs for these categories.

A number of States (e.g., California, Michigan, New York, Pennsylvania, New Hampshire, Maine, Vermont) have implemented control measures for surface-coating facilities/operations.

Table 7 lists major federal initiatives and summarizes significant provisions of each with regard to VOC content requirements.

5.3.4 Other Commercial/Industrial Operations

5.3.4.1 Printing. Printing (sometimes termed graphic arts) includes four major categories: flexography, lithography, rotogravure, and letterpress. Control actions are often specific to a particular printing category.

Federal Initiatives. A draft CTG developed by USEPA in 1991, recommended a 90% reduction in VOC emissions from dryer exhaust in heatset web printing operations. Alcohol content limits for fountain solutions were also recommended. Higher alcohol content may be used if the solution is refrigerated. A VOC content limit of 30% was recommended for cleaning solutions.

In 1996, a NESHAP was finalized for rotogravure and flexographic operations. For publication rotogravure printing, the emission standard for organic HAP is 8% of the total volatile matter used. Alternatively, a control and capture technology capable of reducing organic HAP emissions by 92% may be used. For product and packaging rotogravure and wide-web flexographic operations the organic HAP emission standard is (i) 5% of the organic HAP applied; or (ii) 4% of the mass of inks, coatings, varnishes, adhesives, primers, solvents, reducers, thinners, and other materials applied; or (iii) 20% of mass of solids applied. The alternative capture and control technology must reduce organic HAP emissions (i) by 35% of organic HAP applied, or (ii) to 0.20 kg organic HAP per kg of solid applied.

State Initiatives. The California Air Resources Board (South Coast Air Quality Management District) has an extensive rule covering all graphic arts categories, which sets VOC content limits on materials used in these processes. For example, inks must not exceed 300 grams of VOC per litre and fountain solutions (including any added material) must not exceed

Table 7 Summary of Major Federal Industrial Surface Coatings Initiatives*

Initiative	Content/Emission Limits/Controls
Wood Furniture Coatings CTG (1996)	kg VOC/kg solids: Water-based Coatings Topcoats–0.8 High Solids Coatings Sealer–1.9 Topcoat–1.8 Acid-cured alkyd amino vinyl sealers–2.3 Acid-cured alkyd amino conversion varnish topcoats–2.0
Wood Building Products NESHAP (2003)	Separate OHAP emission limits for new sources and existing sources for five categories of wood building products. Emission limits are in kg OHAP/L, solids applied.
Automobile and Light-duty Truck Coating and Manufacture NESHAP (2002, proposed)	New Facility: 0.036 kg OHAP/L of coating 0.060 kg OHAP/L of coating and operating limits Existing Facility: 0.072 kg OHAP/L of coating 0.132 kg OHAP/L of coating and operating limits Content limits for adhesives, sealers, deadeners, electro-deposition primers
Shipbuilding and Ship-repair (Surface-coating) Operations CTG (1996, developed in conjunction with a corresponding NESHAP)	VOC content limits specified for 23 categories of marine coatings
Aerospace Manufacturing and Rework Coatings CTG (1996, draft, developed in conjunction with a NESHAP)	VOC content limits specified for 55 aerospace specialty coatings Examples: general use, antifoulant, heat resistant, high gloss, high temperature, non-skid
Metal Furniture Surface Coatings NESHAP (2003)	New Sources: 0.094 kg OHAP/L of coating solid Existing Sources: 0.10 kg OHAP/L of coating solid
Large Appliances NESHAP (2002)	New Sources: 0.022 kg OHAP/L of coating solid Existing Sources: 0.13 kg OHAP/L of coating solid

Miscellaneous Metal Parts and Products NESHAP (2004)	New Sources: General use coating: 0.23 kg OHAP/L High performance coating: 3.30 kg OHAP/L Existing Sources: General use coating: 0.31 kg OHAP/L High performance coating: 3.30 kg OHAP/L	
Metal Coil NESHAP (2002)	OHAP emission reductions of at least 98% for new and existing sources No more than 0.046 kg OHAP/L of solids applied	
Plastic Parts and Products NESHAP (2003)	New Source (kg OHAP/kg coating solid)	Existing Source (kg OHAP/kg coating solid)
Paper and Other Web (Film and Foil) Coatings NESHAP (2002)	New Source (OHAP emissions)	Existing Source (OHAP emissions)
	2% of total OHAP applied, or 8% of total solids applied, or 1.6% of total mass of coating material applied	5% of total OHAP applied, or 20% of total solids applied, or 4% of total mass of coating material applied

***Note:** OHAP = organic hazardous air pollutant; most instruments allow capture systems and control devices as an alternative to content limits, provided these achieve the same reductions as the limits.

80 grams of VOC per litre (100 grams of VOC per litre if a refrigerated chiller is used). If approved, compliance may be alternatively achieved by using an emission control system that will reduce emissions from non-compliant materials to a level equal or lower than from compliant materials. In addition, the requirements of a separate rule, applicable to all solvent cleaning operations, addresses solvent cleaning of application equipment, parts, tools, machinery, general work areas and the disposal of VOC-containing materials used in these cleaning operations.

A number of other States also regulate the VOC emissions produced by printing and publishing operations. The State of Maryland, for example, has a regulation for flexographic printing requiring operations to use water-based inks containing less than 25% VOC by volume of the volatile portion of the ink or high solids inks containing not less than 60% non-volatiles. (If an operation cannot meet these requirements, the Maryland rule requires a 60% reduction in the VOC content of each ink or the average VOC content of inks used at each press.) The Maryland rule currently applies to sources with daily emissions over 100 pounds (45 kg).

5.3.4.2 Solvent Cleaning and Degreasing. There are two basic types of solvent cleaning: (i) Vapour Degreasing in which a machine is used to boil liquid solvent generating a solvent vapour that is used in the cleaning activity, and (ii) Cold Solvent Cleaning in which parts are cleaned using a solvent maintained below its boiling point.

Federal Initiatives. The two major initiatives at the federal level are a 1977 CTG and the 1994 NESHAP on Halogenated Solvent Cleaning.

Both equipment specifications and operating procedures are specified in the 1977 CTG. Required control equipment can be as simple as a manually operated tank cover or as complex as a carbon adsorption system depending on the type, size, and design of the degreaser.

For the halogenated solvent cleaning NESHAP, each equipment owner or operator can install one of the specified control combinations. As an alternative to complying with the equipment standards option, each owner or operator of batch vapour or in-line cleaning machines may elect to comply by demonstrating that each solvent-cleaning machine emits less than the overall solvent emissions limits specified in the standards.

State Initiatives. State initiatives build upon the federal CTG. Generally, for cold-cleaning operations, the regional and state programs include more stringent operating requirements, equipment requirements, VOC limits, and record-keeping requirements. California requirements focus on VOC content limits for solvents. An OTC model rule limits the volatility of solvents used in cold cleaning.

5.3.5 VOC Reactivity

Photochemical reactivity is a measure of the extent to which a particular VOC compound reacts in the atmosphere and contributes to the formation of ozone. Often the term is shortened to simply “reactivity.”

An early policy decision taken by USEPA in 1977 was that if resources are limited, the first priority for VOC control should be control of the more reactive compounds. In 1992, the USEPA adopted a general definition of VOC which addressed this earlier policy decision by incorporating a list of negligibly reactive compounds not considered VOC for regulatory purposes. Currently there are over 40 compounds or classes of compounds on the negligible reactivity list. In practice, the USEPA has used only two categories for VOC controls: compounds that must be controlled, and those that are exempt from control.

The USEPA is currently re-evaluating its policy on “reactivity” to determine whether new scientific information developed over the past 25 years warrants update and revision of the 1977 policy. One of the developments on reactivity being carefully considered by the USEPA in this re-evaluation is the approach taken by the California Air Resources Board in developing a regulation for aerosol spray paints. This regulation attempts to control the product-weighted reactivity of solvents in a product, rather than the total mass of VOC emitted. A discussion paper on future USEPA policy is anticipated in 2004.

6 Situation in the European Union

The approach by the European Union (EU) to the limitation of VOC emissions from organic solvents is addressed under EU Council Directive 1999/13/EC (effective March 11, 1999). The Directive, which each member country was required to bring into force within their respective jurisdictions by April 2001, is aimed at reducing emissions from solvents used in selected activities. The 20 activities targeted for control are, for the most part, consistent with ones identified in Canada and the US as significant sources of VOC emissions (e.g., printing, surface coating, surface cleaning, vehicle coating).

For each of the activities, a minimum consumption limit is specified for the purpose of identifying applicable processes. In general, activities operated above this consumption threshold will need to either:

- meet an emissions limit value in waste gases and a fugitive emission value; **or**
- meet the total emission limit value; **or**
- implement a solvent reduction scheme to reduce emissions from the installation equal to those that would be achieved by meeting the total emission limit value.

New processes and installations had to meet compliance requirements on or before April 2001 and existing facilities have to be in compliance on or before October 31, 2007. To ensure compliance with requirements of the Directive, affected facilities are required to provide solvent throughput information in the form of a solvent management plan.

Until recently, the EU had not implemented mandatory requirements for VOC content in consumer and commercial products. Instead, the strategy had been to use a general eco-labelling regulation which has been in place since 1992 to facilitate the supply and demand of greener products. To date, more than 80 indoor paints and varnishes are allowed to display the EU eco-label, meaning that the respective manufacturers have to voluntarily meet stringent environmental criteria including maximum VOC content. Other solvent-containing consumer products under study for eco-labelling are cleaning products and hair sprays.

In January 2003, the European Commission presented a proposal to set EU-wide limits on solvent content in paints, varnishes, and vehicle refinishing products. The legislative proposal has now been approved by the European Parliament, with some amendments to the content limits. The proposal, however, still must be approved by the EU Council of Ministers.

The proposed requirements will come into effect in two phases. The first phase will apply from January 1, 2007; while the second phase will apply from January 1, 2010. (For vehicle refinishing products there will only be one phase which will apply from January 1, 2007.) Limit values for decorative paints in Phase I will range from 50 g/L for waterborne primers to 750 g/L for some special solvent-borne primers. For Phase II, limit values will be further lowered significantly for most categories. These measures, when fully implemented within the EU, will reduce the VOC content of the specified products by 50% (280 000 tonnes). This product-oriented approach, similar to that of the US, was seen as offering the best guarantees of attaining EU environmental aims for ground-level ozone.

7 The Federal Agenda for VOC-containing Products

On March 27, 2004, the Minister of Environment and the Minister of Health published in *Canada Gazette Part I* a “Federal Agenda for Reduction of Emissions of Volatile Organic Compounds from Consumer and Commercial Products.” Actions included in the Agenda follow.

1. Action on National Emission Standards for VOC Content of Consumer and Commercial Products

The Minister of the Environment and the Minister of Health intend to proceed with the development of regulations under Part 5 of *CEPA 1999* to establish national VOC emissions standards for certain consumer and commercial products by prescribing maximum VOC content limits. The intent of these regulations is to align with similar requirements implemented in the US. The primary point of reference for such alignment will be regulatory measures by the USEPA; however, regulatory actions taken by US regional authorities to achieve the US NAAQS for ground-level ozone, such as the States of the Ozone Transport Commission (22 northeastern and mid-western States) and the State of California, will also be considered. The following specific regulatory initiatives are planned.

Consumer Products

- The proposed Regulations under *CEPA 1999* will be developed for national VOC emission standards for certain categories of consumer products; aligned with the requirements of the USEPA rule, National Volatile Organic Compound Emission Standards for Consumer Products, September 1998, and taking into consideration the requirements of the US Ozone Transport Commission’s Model Rule for Consumer Products, March 2001, where appropriate.
- The proposed Regulations will be developed through the regulatory process, commencing in 2004 with implementation by 2007.
- The voluntary measures proposed in the *CEPA 1999* Guideline for Reducing Emissions of Volatile Organic Compounds from Consumer Products, November 2002, will be considered in the development of the proposed Regulations. The recommended emission standards included in the Guideline are based on the USEPA rule.
- As part of the Formulants Program, Health Canada’s Pest Management Regulatory Agency will manage VOC content in pesticide products included in the USEPA rule, under the authority of the *Pest Control Products Act*. A strategy and any instruments for managing VOC in pesticides will be developed, commencing in 2004 with implementation by 2007.

Architectural and Industrial Maintenance Coatings

- The proposed Regulations under *CEPA 1999* will be developed for national VOC emission standards for certain categories of architectural and industrial maintenance coatings; aligned with the requirements of the USEPA rule, National Volatile Organic

Compound Emission Standards for Architectural Coatings, September 1998, and taking into consideration the requirements of the US Ozone Transport Commission's Model Rule for Architectural and Industrial Maintenance Coatings, March 2001, where appropriate.

- The proposed Regulations will be developed through the regulatory process, commencing in 2004 with implementation by 2006.

Automobile Refinish Coatings

- The proposed Regulations under *CEPA 1999* will be developed for national VOC emission standards for automobile refinish coatings; aligned with the requirements of the USEPA rule, National Volatile Organic Compound Emission Standards for Automobile Refinish Coatings, September 1998, and taking into consideration the US Ozone Transport Commission's Model Rule for Mobile Equipment Repair and Refinishing, March 2001, and the National Standards for the Volatile Organic Compound Content of Canadian Commercial/Industrial Surface Coating Products - Automotive Refinishing, October 1998, developed by the CCME.
- The proposed Regulations will be developed through the regulatory process, commencing in 2004 with implementation by 2007.

Future Action on Other Consumer and Commercial Products

- Over the longer term, the Ministers of Environment and Health intend to continue the approach of generally aligning Canadian national emission standards for the VOC content of consumer and commercial products with national actions taken in the US. In the next few years the USEPA will determine the control strategies to be implemented for a number of additional consumer and commercial product categories and the establishment of national regulatory standards may be the option selected in some cases. Early indications are that aerosol spray paints are one category for which the USEPA is strongly considering this approach. In determining future actions, environmental requirements or recommendations developed by the European Union will also be taken into account. There may also be instances where Canada determines additional action on national regulatory standards is required to protect the health of Canadians and the environment.
- The Ministers will determine, by 2006, the strategy with regards to development and implementation of additional national regulatory standards for consumer and commercial products over the 2007–2010 period.
- The USEPA is considering utilizing the ozone-forming potential (often termed “reactivity”) of VOC species in the determination of standards to be specified in future control instruments. It is intended to move in-step with USEPA initiatives on utilizing this approach as the basis of emission standard development for consumer and commercial products to ensure consistency.

2. Action on Emissions of VOC from Consumer and Commercial Products at the Point of End-use

Agreements with End-users

In certain situations, emissions from the use of VOC-containing products may be most efficiently addressed at the point of end-use. The USEPA has opted to use end-use control instruments, rather than national regulatory emission standards, in such cases. While all preventive and control options will continue to be kept open, the initial option is to utilize Environmental Performance Agreements, or other voluntary instruments, for similar sector-oriented initiatives in Canada.

- Environment Canada will pursue the negotiation of an Environmental Performance Agreement with the manufacturers of automobiles and light-duty trucks, which will include provisions for the reduction of VOC emissions from coatings used in the assembly phase of these vehicles. In determining the specifications for VOC reductions, careful consideration will be given to alignment with the USEPA requirements included within the CTG for users of auto and light-truck assembly coatings. This Environmental Performance Agreement is targeted for completion by 2005.
- Environment Canada will pursue the development of an Environmental Performance Agreement with major aerospace operations to address VOC reductions from coatings used for manufacturing and rework. In developing specifications for the instrument, careful consideration will be given to the CTG developed by the USEPA for this sector.
- Environment Canada will build upon VOC control initiatives included in the 2002 Environmental Performance Agreement with the Automotive Parts Manufacturers Association. Environment Canada intends to pursue the renewal of this Agreement beyond the current 2007 expiry date, with inclusion of VOC reduction measures consistent with the requirements to be developed by the USEPA for VOC controls for plastic parts coatings. The renewed Environmental Performance Agreement will be in place by 2008.
- Environment Canada will pursue development of Environmental Performance Agreements, or other appropriate voluntary instruments, to address VOC emissions from products used in printing and publishing operations. Due to the variety of operations in this sector, Environment Canada will initially develop a strategy for federal action which will include careful consideration of initiatives by the USEPA and the California Air Resources Board in the areas of lithographic printing materials, flexible package printing materials, letterpress printing materials and paper, film and foil coatings. The strategy will be determined by 2005 and actions identified in place by 2009.
- Environment Canada will also review existing voluntary agreements to which it is a partner and identify, by 2005, any which could usefully be modified to address VOC-containing products.

Promotion and Outreach

- Environment Canada intends to analyze actions taken in the US by the Ozone Transport Commission and the California Air Resources Board to control VOC emissions from degreasing and commercial cleaning products on the basis of volatility and content requirements in order to determine the feasibility and practicality of developing a guideline under *CEPA 1999* modeled on this approach. Such a measure would be complementary to the equipment design and operation criteria of the Environmental Code of Practice for the Reduction of Solvent Emissions from Commercial and Industrial Degreasing Facilities (1995) developed by the CCME.
- Environment Canada will promote adoption by Canadian industry of the best practices for VOC emissions control and reduction developed by the CCME with respect to degreasing (1995), printing (1999), automotive refinish coating (1998), and industrial maintenance coating (2001). This information is the product of a significant federal/provincial/territorial effort and offers considerable reduction potential if widely applied. Environment Canada's promotion activities will be in cooperation with provinces and territories. This activity will be ongoing over the course of the Agenda.
- The National Pollutant Release Inventory (NPRI) will report on VOC emissions from facilities that are major users of VOC-containing products. This effort will provide a yearly report card on the success of reduction efforts at these sites.

3. Action on Federal House Emissions of Volatile Organic Compounds from Consumer and Commercial Products

Green Procurement

Greener government purchasing is part of the Government of Canada's larger goal to integrate sustainable development into the day-to-day decision-making at federal operations. In addition, by virtue of being the largest single buyer and purchaser in Canada, the Government of Canada, through its purchasing practices, can have a significant impact on the products and services available in the marketplace. Effective use of federal purchasing offers the opportunity to influence industry by strengthening market demand for low VOC content products and the implementation of best available VOC control practices at provider operations. Consequently, green procurement not only results in the direct reduction of VOC emissions from federal operations, it also leverages additional reductions in the private sector.

- Environment Canada, working with other federal departments and agencies, intends to pursue the development of criteria that will identify low VOC content consumer and commercial products for the purpose of government-wide green procurement. The basis of such specifications will be low VOC content products certified under the Environmental Choice Program and recommended VOC content limits developed by the CCME for a variety of consumer and commercial products.
- Environment Canada will work with other federal departments and agencies to develop criteria for green procurement from private sector providers of services in publishing/printing, auto-refinishing, painting/coating, and degreasing. These specifications will facilitate the implementation by private sector providers of the VOC

control and reduction measures recommended for these types of operations under relevant codes of practice and guidelines developed by the CCME.

- These initiatives relevant to green procurement specifications for the federal government will be completed by 2006.

Preventive and Control Measures under CEPA 1999

- The Minister of Environment will develop preventive and control measures under Part 9 of *CEPA 1999* specific to (i) the use of industrial maintenance coatings, and (ii) degreasing. Direction (e.g., guidelines, codes of practice, regulations) will be provided to federal operations which are significant users of industrial maintenance and degreasing products on VOC content standards and control/capture measures to be implemented. In developing the instruments careful consideration will be given to information specific to those two categories of products developed by the CCME. The preventive and control measures will be completed by 2008.
- Should some provinces and/or territories choose to utilize mandatory requirements in implementing their action plans to achieve Canada-wide Standards for particulate matter and ozone, action under Part 9 of *CEPA 1999* may be considered for federal operations in that jurisdiction to effect equivalent or better requirements.

8 Consultation Issues and Analysis

8.1 Clean Air Context

Over the course of the consultations, there were several questions regarding the context of this initiative within the larger Federal Clean Air Agenda, particularly concerning efforts on control and reduction of PM and ground-level ozone. Areas of interest are briefly reviewed below.

i) Link between VOC and PM. The PM precursors science report developed by the Meteorological Service of Canada (Precursor Contributions to Ambient Fine Particulate Matter in Canada; <http://www.msc-smc.ec.gc.ca/saib>) establishes a clear link between VOC and PM, but the extent of this relationship is still being clarified. The NARSTO report Particulate Matter Science for Policy Makers: A NARSTO Assessment also provides an excellent overview of the current understanding of airborne PM science (<http://www.cgenv.com/Narsto/>).

ii) Factors Considered in Setting the CWSs for PM and Ozone. Setting the CWSs for PM and ozone required a balance between the desire to maximize health and environmental protection and the feasibility and costs of reducing the pollutant emissions that contribute to the elevated levels of PM and ozone. Atmospheric science, human health effects, vegetation effects, costs, and benefits were all considered in achieving this balance. The CCME Web site (<http://www.ccme.ca/initiatives/standards>) provides the background material considered by the PM and ozone standard development committee in setting the CWS.

iii) Comparability of CWSs and US NAAQS for PM and Ozone. The following table provides a comparison of the Canadian and US standards.

Ozone

Element	CWS	US NAAQS
Level	65 ppb	85 ppb
Form	4 th highest annual 8-hour daily maximum concentration averaged over three years	4 th highest annual 8-hour daily maximum concentration averaged over three years
Attaining/ Achieving the Standard	There is a fixed date (2010) by which all jurisdictions are required to achieve the CWS. Each jurisdiction is responsible for developing and implementing their plans to achieve the CWS.	Designations for attainment and non-attainment areas will occur by April 15, 2004. Once an area is designated non-attainment, each State has a specified time to come into attainment according to its non-attainment classification under the CAAA. This can range anywhere from 3 to 20 years depending upon the degree to which an area is above the NAAQS. States with non-attainment area(s) must submit a State Implementation Plan (SIP) outlining the actions that will be taken to bring the area(s) into attainment.

Particulate Matter

Element	CWS	US NAAQS
Level	24-hour standard: 30 $\mu\text{g}/\text{m}^3$	Annual standard: 15 $\mu\text{g}/\text{m}^3$ 24-hour standard: 65 $\mu\text{g}/\text{m}^3$ *
Form	24-hour standard: 98 th percentile of the 24-hour concentration averaged over three consecutive years.	24-hour standard: 98 th percentile of the 24-hour concentration averaged over three consecutive years. Annual: 3-year average of the annual concentration.
Attaining/ Achieving the Standard	There is a fixed date (2010) by which all jurisdictions are required to achieve the CWS. Each jurisdiction is responsible for developing and implementing their plans to achieve the CWS.	The USEPA will issue its proposed rule for implementation of the PM _{2.5} NAAQS in March 2004, with the final rule coming in the winter of 2004/05. The current date proposed for designation of attainment and nonattainment areas is December 2004. Once an area is designated nonattainment, the current proposal is each State to have five years (an extension of up to five years is possible with adequate demonstration) to come into attainment under the <i>Clean Air Act</i> . This means achievement of the PM _{2.5} NAAQS would be required by the end of 2009 with the possibility of an extension up to the end of 2014. States with non-attainment area(s) must submit a State Implementation Plan (SIP) outlining the actions that will be taken to bring the area(s) into attainment.

* The 24-hour level of the US NAAQS and CWS, however, are not directly comparable because in setting PM_{2.5} standards the USEPA "... proposed that the suite of PM_{2.5} standards could most effectively and efficiently be defined by treating the annual standard as the generally controlling standard for lowering both short- and long-term PM_{2.5} concentrations. In conjunction with the annual standard, the 24-hour standard would serve to provide protection against days with high peak PM_{2.5} concentrations, localized "hot spots," and risks arising from seasonal emissions that would not be well controlled by a national annual standard" (US Federal Register EPA 40 CFR 50, July 17, 1997). Analysis indicates that a 15 $\mu\text{g}/\text{m}^3$ annual concentration would be associated with a 98th percentile daily concentration of about 40 to 50 $\mu\text{g}/\text{m}^3$.

iv) Non-anthropogenic VOC emissions. Environment Canada's criteria air contaminants inventory includes VOC emissions from natural, or biogenic, sources as well as man-made sources (www.ec.gc.ca/pdb/ape_tables/bioVOC95_e.cfm). Volatile organic compound emissions from vegetation account for most biogenic emissions. In the 1995 inventory, VOC emissions from biogenic sources were 12 760 kilotonnes (kt) and anthropogenic source emissions were 2429 kt (excluding forest fires). In the more populated and industrialized parts of the country, however, anthropogenic VOC emissions can be several orders of magnitude higher than the emissions from natural VOC sources and are the main contributors to air quality problems in these areas.

v) Relationship between VOC and PM_{2.5} Health Effects. Specific VOC contributions to the known health effects associated with PM_{2.5} have not been studied. However, there are adverse health effects from PM no matter what the source.

8.2 VOC Emission Inventories and Forecasts

Summary of Stakeholder Comments. Some stakeholders questioned the accuracy of the VOC emission inventory information developed by Environment Canada. They felt reductions in VOC content that had been achieved for consumer products and paints/coatings were not reflected in the Environment Canada estimates. The inventory information, consequently, could be misleading in establishing priorities for action under the Agenda.

Analysis. The national CAC inventory (1995) identifies a total of 2429 kt of VOC emissions for Canada with the most significant sources being transportation (31%), upstream oil and gas (28%), solvent use (19%), industrial sources (10%), residential/commercial fuel/wood combustion (6%), and fuel marketing (4%) (CAC Division, Pollution Data Branch, latest emissions inventory and trends).

Implementation of measures under the “Federal Agenda on Cleaner Vehicles, Engines and Fuels” will achieve substantial VOC reductions from the transportation sector by 2010. Reflecting the success of this program, forecasts for 2010 indicate that solvent use will have replaced transportation as the largest source of anthropogenic VOC emissions in Canada accounting for 32%, compared to 25% for transportation. (Estimates exclude emissions from the “upstream oil and gas” sector as this is primarily a regional issue representing the dominant VOC source in Alberta and a significant source in Saskatchewan.)

The “solvent use” component of the 1995 CAC inventory addresses emissions of VOC from consumer and commercial products and indicates that “paints and coatings” (45%) and “consumer products” (27%) are the predominant contributors.

Volatile organic compound solvent emissions are forecast to increase steadily with an approximately 40% increase anticipated by 2010 compared to 1995, even after taking into account such factors as increased market penetration of non-VOC solvent products, increased recycling, application of emission control technologies, and the influence of regulated VOC content requirements implemented in the US.

Keeping in mind that any inventory is an estimate, Environment Canada is confident that the CAC emission information is indicative of the VOC situation in Canada. The inventory has been developed using a “top-down” approach, estimating total VOC solvent use/application in Canada and profiling this use with respect to major source sectors. While inventories developed using other methodologies would be expected to produce somewhat different results, fundamentally different findings are unlikely.

For purposes of developing this Agenda, the inventory information has been used primarily to substantiate two factors which are important for decision-making: (1) emissions from solvents contribute significantly to the overall atmospheric loadings of anthropogenic VOC, and (2) consumer products and paints/coatings are important sources of emissions from the solvent sector. It should be noted that US inventories are generally consistent with the source sector profile for Canada.

Intended Path Forward. Environment Canada inventories, including those for VOC, are dynamic and subject to regular updating and revision. During ongoing work on VOC inventory development, Environment Canada intends to discuss strategies with stakeholders, particularly affected industry stakeholders, and is prepared to consider any inventory information industry sectors may wish to provide in developing future inventory updates.

8.3 Establishment of National Standards for VOC Content of Certain Categories through Regulation

Summary of Stakeholder Comments. Health and environmental non-government stakeholders were generally supportive of a regulatory approach to address the VOC content of certain categories of products. Most industry stakeholders, however, felt voluntary instruments should be used in all cases. In their opinion, voluntary instruments could achieve the reductions required while providing increased flexibility compared to a regulatory approach.

Analysis. The Departments of Environment and Health have concluded that regulatory instruments are appropriate for certain categories of VOC-containing products, in particular those for which the use pattern is highly dispersive and control at the point of end-use is both impractical and unfeasible. For such products, control is only practical through the pollution prevention approach of establishing VOC content requirements. Establishment of product standards of this type is an area where the federal government is best situated to take action. The USEPA has already implemented VOC content standards for three broad product categories (consumer products, architectural coatings, and automobile refinish coatings) through national regulation.

The Agenda is a mix of instruments, including voluntary and outreach initiatives in addition to regulations. Voluntary strategies are recognized as appropriate control strategies to address some product situations. However, a voluntary approach is not seen as a satisfactory means to achieve assured reductions where product use is dispersive in nature.

Development and implementation of a voluntary instrument, in particular an Environmental Performance Agreement, that would cover all domestic formulators and importers of the products of concern is not practical or possible. An acceptable instrument would require member companies of a number of national associations to sign-on, as well as non-members comprised primarily of importers (ranging from direct importation by large-scale retailers, to small importers dealing with a very limited number of products designated for control).

A regulatory approach establishes a “level playing field” for all domestic industry players, including formulators and importers. It provides the assurance for purposes of business decision-making that all players must meet the same requirements for product content.

The Departments have also concluded that a voluntary approach would have serious shortcomings with respect to transparency and delivery. In deciding on strategies to address air pollution, there is a need to demonstrate leadership and a commitment to effective partnering with provinces/territories and the US. Participation and actions of these groups will be influenced by measures taken at the federal level.

Intended Path Forward. The Departments intend to proceed with regulations under *CEPA 1999* on the VOC content of certain categories of (i) consumer products, (ii) architectural coatings and (iii) automobile refinish coatings. This approach will also be pursued for other product categories for which national regulations on VOC content are implemented by the USEPA.

8.4 VOC Standards for Pesticide Products Listed in the USEPA Rule

Summary of Stakeholder Comments. Several pesticide industry stakeholders have questioned how pesticide products listed in the USEPA Rule will be managed in Canada.

Analysis. Pesticides are regulated by the Pest Management Regulatory Agency (PMRA), Health Canada under the authority of the *Pest Control Products Act (PCPA)*. Volatile organic compounds are present in certain pesticide products as formulants, the non-active component of the formulation, and are therefore subject to PMRA's Formulants Program.

The Formulants Program outlines how formulants are regulated in Canadian pesticide products and ensures that information on formulations is accurate and meets current standards. The program allows the PMRA to manage formulants which are identified as being of concern with respect to human health or the environment.

The Departments recognize that regulation of VOC under both *CEPA* and the *PCPA* would incur an additional regulatory burden for the pesticide industry. To streamline regulatory processes, PMRA will develop a strategy to manage VOC in certain pesticide products under the *PCPA*, aligned with the requirements of the USEPA Rule. The requirements of other jurisdictions will be considered in the development of the strategy.

The PMRA and the USEPA actively seek opportunities to harmonize pesticide regulation. This harmonized approach will be reflected in the PMRA's strategy for VOC content standards. Assuming that most pesticide products are developed for a North American market, the affected products will likely already comply with the US VOC standards.

Intended Path Forward. The VOC standards for pesticide products listed in the USEPA Rule will be managed by the PMRA, under the authority of the *PCPA* and the Formulants Program. The PMRA will develop a strategy and any instruments for managing VOC in these pesticides, with implementation by 2007. The timeframe is consistent with the proposed *CEPA* regulations.

8.5 Alignment with US Emission Standards

Summary of Stakeholder Comments. There was broad support from stakeholders for alignment of national standards on VOC product content in Canada with those in the US, although some cautioned that this should not be at the expense of overriding health and environmental concerns. Generally, all agreed on the integrated nature of the North American market for these products and that alignment with the US was a logical approach for Canada in pursuing emission reductions.

While the general principle of alignment had broad support, there were differing views on some of the details of an "alignment" strategy. Most industry participants proposed voluntary instruments, rather than regulation, as the means to implement US product content

standards in Canada. (The “voluntary” vs “regulatory” issue has been addressed earlier.) Most non-industry stakeholders favoured a regulatory (i.e., mandatory) approach.

In addition, most industry representatives argued that alignment should only consider standards established under US federal regulations. They argued that emission standards being implemented by the OTC and California were unreasonable reference points for requirements in Canada as, to date, applicability in the US marketplace was limited.

With respect to the challenge posed to Canadian companies in meeting the standards of the US federal regulation, there was a mixed message from industry representatives. Some claimed a high degree of compliance with these standards, while others indicated that they would be challenged to meet these values.

Analysis. In pursuing national product content standards for VOC-containing products, stakeholders were supportive of a strategy based on alignment with the US.

In the opinion of the Departments, actions in the US at the federal level, augmented with initiatives undertaken by States in ozone non-attainment areas, have resulted in a comprehensive control regime. The fact that many products which are potential candidates for control action in Canada are subject to transborder trade adds additional support to adoption of similar strategic approaches. In addition, Canada and the US are working cooperatively on transboundary air pollution issues and there are obvious advantages in aligning control measures for a consistent approach.

Environment Canada and Health Canada have concluded that “alignment” with the US must include alignment in terms of instrument of implementation (i.e., regulations), as well as the VOC content specifications. It is possible that had the US chosen to act through a voluntary approach, more ambitious emission standards would have been used as a consequence of the increased flexibility afforded industry.

The Departments have also concluded that it is reasonable to consider the more aggressive VOC content standards adopted, or in the process of being adopted, by OTC States and California. Alignment is intended to facilitate consistency in product requirements in a North American market and to allow Canada to benefit from the US experience in implementing emission reduction strategies. The regulations under *CEPA 1999* for product content standards will be implemented in the 2006–2008 period. Consequently, these standards should reflect product requirements for most of the US market at that time. States of the OTC and California have implemented, or are in the process of implementing, VOC emission standards which are more ambitious than US federal requirements (OTC standards are, by and large, based on those of California). Considering the combined economic activity and population size represented by the OTC and California, these standards, when fully adopted, would represent the requirement for a major segment of the US market.

In addition, the commitment to pursue alignment with US controls assures Canadian industry that regulatory requirements will not necessitate implementation of formulation technologies beyond those already being used by the substantive portion of US industry.

In aligning requirements with those in the US, the Departments intend to carefully consider provisions included in the US regulations to address special situations. One example is the exemption for innovative products dealing with cases where the overall VOC reduction goal

is met, and often exceeded, through the use of new product technologies, even though the VOC content may exceed the regulatory limit.

Intended Path Forward. The Departments intend to proceed with the development of national emission standards through *CEPA 1999* regulation for certain categories of consumer and commercial products, aligned with US measures. While the primary reference point in determining parameters for alignment will be the US federal regulations, actions taken by the OTC and California will be given consideration where such measures appear to have a national influence in the US.

8.6 Impact of US Federal VOC Content Requirements on Products Marketed in Canada

Summary of Stakeholder Comments. Some industry stakeholders suggested there was already considerable compliance with the US federal regulations as a consequence of many products being formulated for a common North American marketplace. They questioned the significance of real reductions that would result from Canadian regulations. In addition, stakeholders argued that a high rate of compliance was further support for a voluntary, rather than regulatory approach.

Analysis. The Departments appreciate that, for some categories of products, there is a high degree of compliance with the US federal rule as a consequence of cross-border trade. However, this is by no means the case for all product categories. Products formulated primarily for the local domestic market and products imported from off-shore are two important areas where the US federal rule is not a driver. Indeed, some industry representatives have commented that formulation to US requirements does pose a challenge for their products.

As has been stated previously, in establishing Canadian content standards, consideration will be given to the more ambitious standards implemented, or in the process of being implemented, by the OTC and California. Industry stakeholder comments over the course of the consultation suggest that, in their opinion, there is currently little product in the Canadian marketplace meeting these requirements.

Intended Path Forward. The Departments will proceed with implementation of national standards for VOC content of certain categories of products through regulation under *CEPA 1999*. In establishing the standards, an important goal will be alignment with the requirements for similar products in the majority portion of the US market at the coming-into-effect dates of the *CEPA* regulations.

8.7 Relationship of the CEPA 1999 Guidelines for Consumer Products and Agenda Proposals for these Products

Summary of Stakeholder Comments. Some industry stakeholders noted that *CEPA 1999* Guidelines for VOC in Consumer Products were published in November 2002 and felt that

the Guidelines, as a relatively recent initiative, should be the instrument for addressing consumer products. Stakeholders suggested that regulatory action be considered only after the Guidelines had been in place for a number of years and it had been shown to be ineffective in achieving reduction goals.

Analysis. The *CEPA 1999* Guidelines were the end product of a specific work plan element under the CCME Smog Management Plan of the 1990's. The development of the Guidelines has served as an effective means of engaging the consumer product industry in seeking VOC reductions from their product suite. The Guidelines will function as a bridging mechanism over the next 3–5 years, pending the implementation of regulatory VOC content requirements in the 2006–2008 period. The Guidelines are based on content standards aligned with the US federal regulation for consumer products, consistent with the approach to regulation development.

The Guidelines are a voluntary instrument. Concerns with this type of approach are discussed in Section 8.3. In addition, the VOC content requirements included in the Guidelines reflect the US marketplace situation of the mid-1990's and more ambitious targets may be reasonable for the 2006–2008 period when the regulations will take effect.

Intended Path Forward. The Departments intend to proceed with the development of VOC content standards for consumer products through *CEPA 1999* regulations. The *CEPA 1999* Guidelines for VOC in Consumer Products will serve as a bridging mechanism until regulations are implemented.

8.8 Legal Authorities for VOC Content Standards

Summary of Stakeholder Comments. Some stakeholders asked for assurance that the Departments have the requisite legal authorities to implement national emission standards for products through *CEPA 1999* regulations.

Analysis. The necessary legal authorities are in place to support a regulatory approach under *CEPA 1999* as the basis of national content standards for VOC-containing products.

Volatile organic compounds as precursors to PM and ozone, were added to the List of Toxic Substances (Schedule I) of *CEPA 1999* on July 2, 2003, providing the authority to develop regulations under sub-section 93(1)(n) of the Act. Under these provisions, regulations may be made with respect to the quantity or concentration of toxic substance in any product manufactured, exported, imported, offered for sale or sold in Canada.

Intended Path Forward. Environment Canada and Health Canada with the necessary legal authorities, will pursue the development and implementation of appropriate *CEPA 1999* regulations for the VOC content of certain product categories.

8.9 Inclusion of Voluntary Measures

Summary of Stakeholder Comments. Some stakeholders suggested that the Departments consider mandatory (i.e., regulatory) action for some of the areas for which voluntary instruments were proposed, particularly Environmental Performance Agreements. These stakeholders felt sector emissions should be subject to the same type of stringency proposed for initiatives on VOC-containing products.

Analysis. The Departments are of the opinion that, in certain situations, voluntary instruments can be an effective and efficient means of achieving an environmental objective. Environmental Performance Agreements provide a mechanism to address VOC emissions

from the use of commercial products in industrial settings where control is most effectively implemented at the point of end-use and the population of end-users is readily identifiable. Following the general principle of alignment with the US, the Departments have concluded that Environmental Performance Agreements provide a mechanism for use in situations where control of the end-user/point of end-use is the most appropriate option. At the federal level in the US, the USEPA has used CTGs in lieu of regulations in such situations, with application targeted for those areas within the US where there are ground-level ozone challenges. Environmental Performance Agreements allow a similar sector oriented approach and provide flexibility in engaging situations and facilities in areas where the challenge for achieving CWS targets is greatest.

Intended Path Forward. The Departments will proceed with the negotiation of Environmental Performance Agreements for certain sectors. Candidate sectors will be based on (i) opportunities for alignment with a CTG developed by the USEPA or application of a relevant CCME code/guideline, (ii) situations where the end-users are easily identifiable and numbers are limited; and (iii) the preponderance of emissions for the sector are in Canada's Pollution Emission Management Area as identified in the Canada–US Ozone Annex.

8.10 Reduction Goals

Summary of Stakeholder Comments. Some stakeholders indicated that it would be useful to have additional information and clarification of the Agenda reduction goals, particularly with respect to proposed regulatory initiatives. They also questioned whether the regulations could potentially be overly ambitious and result in VOC reductions in excess of that required to achieve the CWS targets for particulate matter and ground-level ozone.

Analysis. Volatile organic compounds are precursors to both ground-level ozone and particulate matter. Reductions in VOC will be required to achieve the CWS targets for both of these pollutants. The reduction challenge is greatest in the Windsor–Quebec City corridor, an area included within Canada's Pollution Emission Management Area under the Canada-US Ozone Annex. In developing a long-term strategic approach for clean air in Ontario, the provincial government has identified a 45% reduction from 1990 levels as the target for all smog-associated emissions, including VOC. The 45% VOC reduction target for Ontario is one of Canada's commitments under the Ozone Annex. In a 1999 analysis done in support of federal/provincial/territorial discussions on establishing the CWSs for particulate matter and ozone, a 35% reduction of VOC was identified as the VOC reduction required for the province of Quebec to achieve the CWS goals.

Volatile organic compound emissions from solvent-containing products are a major contributor to the overall anthropogenic total and the reduction goal for this source sector must be consistent with the overall VOC reduction target. There is no basis for anticipating reductions in other VOC source sectors to be more easily achievable, thereby lessening the reduction burden for solvents.

Estimates of reductions for each regulatory initiative must await proposals to be advanced for the content standards for the specific product categories to be addressed under the instrument. It is possible, however, to develop a general appreciation of the reduction range under consideration for the three initial areas of regulatory action (consumer products,

architectural and industrial maintenance coatings, automobile refinish coatings) based on estimates developed in the US in support of federal and OTC/California initiatives.

The USEPA has developed estimates of the VOC reductions resulting from their national regulations, referenced to a base year of 1990. The estimated reductions are: consumer products–20%; architectural coatings–20%; and automobile refinish coatings–33%. It should be noted that these estimates are the cumulative total for the particular products addressed by the regulations, not the overall product sector. For example, the 20% reduction for consumer products applies to the total reduction attributable to the control action on the 24 products included in the regulation. As these products account for approximately 50% of VOC emissions from the overall consumer product source sector, a 20% estimated reduction for the regulated product suite may equate to a 10% reduction for the sector.

Coincidentally, 1990 is the key reference year used by jurisdictions in estimating reduction requirements to meet CWS targets, as well as the base year referenced in the Ozone Annex for characterizing reduction goals for the Parties. Consequently, on the assumption that the VOC content characteristics of solvent-containing products in the Canadian marketplace in 1990 were generally comparable to the US situation, the USEPA estimates constitute a conservative estimate of the low-end of the reduction range for the regulatory initiatives under the Agenda. The more ambitious OTC/California content standards will be considered for the *CEPA 1999* regulations and the full-scale adoption of these values would characterize the upper-end of the reduction range potentially achievable. The OTC/California standards have the potential for an additional 10–20% VOC reduction for regulated consumer products and architectural coatings, increasing potential total reductions to 30–40% (OTC/California reductions being in addition to the 20% attributable to the USEPA controls). There would, however, be only minor incremental reductions in automobile refinish coatings.

Intended Path Forward. Reduction estimates will be developed by Environment Canada as each control measure is developed. These will be available for stakeholder consultations. The anticipated emissions reductions for each product addressed by the measure will be approximated.

8.11 Reporting on Results

Summary of Stakeholder Comments. Some stakeholders expressed an interest in the manner by which the public will be kept informed of the success in achieving VOC reductions as a consequence of actions implemented under the Agenda.

Analysis. Environment Canada regularly updates its CAC inventory which includes VOC information on solvent (i.e., product) emissions. Reductions achieved as a consequence of actions arising from the Agenda will be factored into the development of VOC inventory information. The CAC inventory is publicly available on the Environment Canada Web site.

Environment Canada has dedicated a Web site for the VOC Agenda. This site will provide a status report on action taken in support of the Agenda and associated documentation (www.ec.gc.ca/nopp/voc/en/index.cfm).

In addition, jurisdictions party to the CWSs on particulate matter and ozone will be undertaking a mid-course analysis in 2005 with respect to progress made in achieving the standards, as well as an in-depth assessment in 2010. Both of these initiatives will involve consideration of reductions achieved as a consequence of actions under the various jurisdictional action plans, including the Federal VOC Agenda on solvent-containing products. The results of both studies will be shared with stakeholders.

Intended Path Forward. Stakeholders will be advised of progress under the Federal VOC Agenda on solvent-containing products through the systematic updating of Environment Canada's CAC inventory, the development and maintenance of a dedicated page on the Environment Canada Web site, and the joint jurisdictional analysis of progress on meeting CWS targets for PM and ozone.

8.12 Economic Analysis

Summary of Stakeholder Comments. Some stakeholders stressed the need to examine the economic impacts on Canadian companies of implementing the regulations proposed under the Agenda.

Analysis. The development of regulations proposed under the Agenda will be undertaken consistent with all consultation and analytical processes which are standard for such initiatives. A regulatory impact analysis will be part of each regulation development exercise and will include an estimate of the economic impacts on Canadian industry. This assessment will consider the specific VOC content standards and product categories proposed for inclusion in each of the regulations.

A summary of the socio-economic analysis will accompany the publication of the proposed Regulations in *Canada Gazette I* and the final regulation in *Canada Gazette Part II*. During the regulatory consultations, stakeholders will have the opportunity to provide information and views on factors for consideration in estimating economic impacts.

Intended Path Forward. Analysis of the potential economic impacts on Canadian industry of regulatory initiatives establishing VOC content standards for consumer and commercial products will be undertaken as part of the overall socio-economic analysis for each regulation.