CCME

Canadian Council of Ministers of the Environment

Le Conseil canadien des ministres de l'environnement

National Action Plan

for the Environmental Control of Ozone-Depleting Substances (ODS) and their Halocarbon Alternatives

January 1998

Prepared by the Federal Provincial Working Group on Controls Harmonization (ODS)

CCME PN 1291

The Canadian Council of Ministers of the Environment (CCME) is the major intergovernmental forum in Canada for discussion and joint action on environmental issues of national, international and global concern. The 13 member governments work as partners in developing nationally consistent environmental standards, practices and legislation.

The CCME Secretariat may be contacted at :

Canadian Council of Ministers of the Environment
123 Main Street, Suite 360
Winnipeg, Manitoba, R3C 1A3
Tel: (204) 948-2090
Fax: (204) 948-2125

Additional copies of this National Action Plan may be obtained from:

CCME Documents
c/o Manitoba Statutory Publications
200 Vaughan Street
Winnipeg, Manitoba R3C 1T5
Tel: (204) 945-4664
Fax: (204) 945-7172

This Plan updates the original Action Plan issued in 1992, entitled "NATIONAL ACTION PLAN FOR THE RECOVERY, RECYCLING, AND RECLAMATION OF CHLOROFLUOROCARBONS (CFCs)".

Comments regarding the content of this Plan should be addressed to:

Chair, Federal-Provincial Working Group on Controls Harmonization (ODS)
c/o Commercial Chemicals Evaluation Branch
Environmental Protection Service
Environment Canada
Ottawa, Ontario
K1A 0H3

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Abstract

This report updates the National Action Plan for Recovery, Recycling, and Reclamation of Chlorofluorocarbons (CFCs), published in 1992 by the Canadian Council of Ministers of the Environment (CCME). The new plan incorporates many of the recommendations and suggestions that resulted from the national consultations that took place in 1995 and led to the report "Strengthening Canada's Ozone Layer Protection Program." Moreover, stakeholders have had the opportunity to provide comments on a draft version of this action plan in April 1997. New objectives, tasks and schedules have been identified to provide the framework for federal and provincial programs, regulatory action and data development in order to enhance the ozone protection program in Canada. The plan has been expanded to incorporate all ozone-depleting substances and the halocarbon alternatives that have entered the market place. These halocarbon alternatives do not contribute to ozone depletion but many of them have a high global warming potential which justifies consideration of cost effective emission controls.

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As one of the early signatories to the Montreal Protocol on Substances that Deplete the Ozone Layer, Canada has consistently met or exceeded its obligations under the Protocol, to protect the ozone layer. An important component of the program to address this issue was the "National Action Plan for Recovery, Recycling and Reclamation of CFCs" (NAP), approved and published by the Canadian Council of Ministers of the Environment (CCME) in 1992. The NAP provided a national framework for a harmonized approach by the federal, provincial and territorial governments to implementation of an ozone layer protection program primarily focused on CFCs used in refrigeration and air conditioning systems.

Significant progress has been achieved to date. CFCs, carbon tetrachloride, methyl chloroform and halons are no longer produced or imported in Canada. Nine of the provinces and one of the territories have regulations that mandate recovery and recycling and prohibit the releases of Ozone Depleting Substances (ODS). More than 75,000 service technicians in the refrigeration and air conditioning sector have received environmental awareness training. Public interest in and awareness of the issues involved, has been raised.

In 1994, the National Air Issues Coordinating Committee of the CCME, directed the Federal Provincial Working Group on Controls Harmonization (ODS) (FPWG) to undertake public consultations for strengthening Canada's ozone layer protection program. Consultations were carried out nationwide and the recommendations resulting from that process were endorsed by CCME in May 1995. The National Action Plan (NAP) needs to be updated to include these recommendations.

The new NAP addresses all ODS, their associated systems, their halocarbon alternatives and identifies new tasks to be implemented. These tasks incorporate a pollution prevention strategy to reduce emissions and consideration of a use phase-out of existing CFCs and halons and of options for disposal of surplus quantities. The new NAP also proposes to give consideration to further emission reductions in other industry sectors such as solvent cleaning, sterilant carrier gases, foam blowing and aerosol applications. Continued coordination and harmonization by all levels of governments will be needed to enable the successful implementation of a strengthened Canadian ozone layer protection program.

Section 1

Introduction

Substantial progress has been made in Canada to reduce the emissions of ozone-depleting substances (ODS), through strong regulatory action taken by federal, provincial and territorial governments, changes in technology, and voluntary actions by industry, such as the use of alternatives to ODS.

In 1992, CCME published a National Action Plan (NAP) for Recovery, Recycling, and Reclamation of Chlorofluorocarbons which identified objectives along with the tasks and schedules to achieve them. In 1994, the National Air Issues Coordinating Committee (NAICC) directed the Federal-Provincial Working Group (FPWG) on Controls Harmonization to undertake public consultations to ascertain appropriate actions to strengthen the Canadian ozone layer protection program. The consultations focused on:

- further reducing ODS emissions,
- destroying unneeded ODS,
- taking a sustainable approach to alternatives,
- implementing additional controls and,
- putting more emphasis on international activities.

The FPWG published the conclusions and recommendations in a report entitled "Strengthening Canada's Ozone Layer Protection Program." The recommendations were endorsed by the CCME in May 1995.

The NAP has been revised and updated and incorporates the recommendations and will be the framework for the continued coordination of the respective efforts of the federal, provincial and territorial governments in ODS management and control. The new NAP describes the necessary activities (Tasks) to meet the objectives of control, reduction, and elimination of emissions of ODS and certain halocarbon alternatives. It also addresses the ultimate phase-out and disposal of all ODS in Canada. To be successful, the program must continue to be implemented in a harmonized manner across the jurisdictions involved.

1.1 Background

The development of the theory of ozone depletion and its subsequent confirmation by scientific study led to the signing of the Vienna Convention on the Ozone Layer in 1985. Signatories agreed to further study and consult on the causes and effects of ozone layer depletion. There is now a large consensus that anthropogenic releases of compounds containing chlorine to the atmosphere cause ozone depletion which allows for an increase in the amount of ultraviolet (UV) radiation to reach the earth's surface. There is evidence that human exposure to increased UV radiation will lead to an increase in the incident of sunburn, skin cancer, eye cataracts, and the weakening of the human immune system and photoaging of the skin and eye. Although human behavior modifications can affect UV

radiation exposure, the best way to protect the health of the population is to maintain an adequate stratospheric ozone layer.

Ecosystem health is also adversely affected by increased UV radiation. This begins at the bottom of the food chain where increased UV radiation reduces the plankton population in the ocean and vegetation production on land. Wildlife and domestic animals may also be affected either directly or indirectly.

Canada played a major role in the development of the Montreal Protocol on Substances that Deplete the Ozone Layer, and was one of the first signatories to the Protocol in 1987. Following ratification, the Protocol came into effect in 1989, requiring signatories to reduce consumption (production + imports - exports) of certain ODS, mainly CFCs. Subsequent amendments to the Protocol have increased the reductions and shortened the time frame in which these consumption reductions were to be achieved.

In April 1989, the Federal-Provincial Advisory Committee (FPAC) under the Canadian Environmental Protection Act (CEPA) coordinated the development of controls across all jurisdictions. In June 1989, the Federal-Provincial Working Group (FPWG) was established to develop a strategy for harmonization of controls. The FPWG comprises representatives from all levels of government. The strategy and its recommendations for implementation were approved by the CCME in November 1990, and the FPWG was instructed to develop an Action Plan to implement recovery, recycling, and reclamation of CFCs across Canada.

At their meeting in March 1992, CCME Ministers announced that all jurisdictions would begin implementing CFC recovery and recycling initiatives by the end of 1992. The Ministers also announced that mandatory recovery and recycling programs must become one of the focal points of Canada's effort to protect the ozone layer.

The original National Action Plan (NAP) was approved in October 1992 and issued as a CCME document, entitled: "National Action Plan for Recovery, Recycling, and Reclamation of Chlorofluorocarbons (CFCs)". The NAP focused mainly on recovery, recycling, and reclamation of CFCs from refrigeration and air conditioning systems. The tasks included in the original NAP are summarized in Section 2 of this report.

In Canada, the consumption phase-out for CFCs, halons, carbon tetrachloride, methyl chloroform and hydrobromofluorocarbons (HBFCs) is now complete. In addition, hydrochlorofluorocarbons (HCFCs) and methyl bromide have also been targeted for phase-out.

The objectives, tasks, and infrastructure for the new plan are described in Section 3 of this report, which has been prepared by the FPWG, taking into account information received from producers, users, and trade associations, as well as various ministries and departments, during the consultations for strengthening Canada's ozone layer protection program. The new plan also addresses concerns about the CFC alternatives, including HFCs, and their effects on global warming.

1.2 Industry Sectors, Uses and Consumption

CFCs were first introduced in the 1930s as a substitute for toxic refrigerants such as sulphur dioxide and ammonia. As a wide range of CFC-based compounds became available, CFC uses spread into other industry sectors, such as aerosols, foam blowing, solvent cleaning, sterilant carrier gas, and laboratory uses. Two other sectors where the use of ODS grew substantially are the fire protection and pest control sectors.

The following provides a brief overview of the uses of ODS by industry sectors in Canada.

1.2.1 *Refrigeration and Air Conditioning Sector*

The development in the 1930s of low toxicity, non-flammable heat exchange fluids, such as CFCs, helped accelerate the market for home refrigerators and later, for freezers. A wide range of CFCs permitted development of low temperature freezers, display cases and building air conditioning systems. The environmental impacts of CFCs were neither known nor considered at that time. Due to their relative low cost and low toxicity, the previous practice of recovering refrigerants during servicing was abandoned and increasing quantities of these substances began to enter the atmosphere.

The phasing-out of the production and import of CFCs, as well as environmental awareness training for service people and mandatory recovery and recycling regulations, have substantially reduced emissions of refrigerants in Canada.

The use of HCFCs, HFCs and blends has helped provide alternatives on an interim basis. However, the use of these substances, some of which are ODS, and the large inventory of CFCs in existing systems, means that continued effort will be required to control and eliminate ODS emissions.

1.2.2 *Aerosol Sector*

The aerosol industry grew out of need for portable, dispersible insecticides during World War II. Following this period, the industry grew at a phenomenal rate until the late 1970s, when the question of ozone depletion became a concern. Canada and the United States were the first two countries to take action to limit the types of products that could use CFCs in aerosols.

The use of CFCs in aerosol products has been replaced mainly by mechanical devices, HCFCs, HFCs and hydrocarbons. Other chemicals such as dichloromethane have also been used in specific applications. The only exception is in some medical applications such as medical inhalers. HCFCs constitute a threat to the ozone layer, although much less than CFCs, and therefore their use will have to be monitored and controlled.

1.2.3 *Foam Blowing Agents Sector*

In the 1970s, the demand for foam insulation rose dramatically as a result of the oil shortage and the concerns about the carcinogenic properties of asbestos. Foams are also used as packaging materials. The use of CFCs as the blowing agent in foams has been discontinued. Substitute chemicals such as HCFCs, hydrocarbons, dichloromethane and blends containing these materials are now used.

1.2.4 *Solvents Cleaning Sector*

CFCs, carbon tetrachloride, methyl chloroform and HCFCs are used as cleaning agents for printed circuit boards, electronic components, electrical assemblies and components, maintenance cleaning, avionics and precision metal parts, and dry cleaning of specialty garments. These applications produce a high rate of emissions because the solvents are mostly not recovered due to obsolete equipment, poor equipment design, and a lack of training. Market forces and regulations are now phasing out the use of CFCs, carbon tetrachloride and methyl chloroform in these applications.

1.2.5 *Sterilant Gas Sector*

Due to the sensitivity of certain medical equipment to heat and the long retention time with steam systems, alternative sterilization systems using ethylene oxide were developed. Ethylene oxide is extremely reactive and toxic, therefore, CFC-12 was added as an inert carrier gas to dilute the ethylene oxide to safe but effective concentrations. Alternative carrier gases, including HCFCs, have been introduced. In addition, new systems that do not require a carrier gas are now in use (e.g. plasma sterilization).

1.2.6 *Metered-Dose Inhalers*

CFCs are used as carriers and solvents in metered dose inhalers which are small devices used to prevent and relieve asthma and other pulmonary diseases. The medical aerosol industry received an exemption to the ban on CFC production and import to continue the manufacture of metered-dose inhalers (MDIs). This exemption was granted because of the long lead-time required to approve an alternative delivery agent under the Food and Drugs Act. Alternatives for some MDIs have been developed and are expected to be available in Canada shortly.

1.2.7 *Laboratory Use Sector*

A very small volume of ODS is used in laboratories The use of certain ODS is entrenched in some analytical and research procedures but alternatives are being considered and used in certain applications.

1.2.8 *Fire Protection Sector*

Halons were developed during the Second World War for military applications where the available agents imposed severe weight and space penalties that were unacceptable for use on board aircraft, armoured fighting vehicles and ships. In

addition, occupant safety after a discharge was critical. Since then, halons have been used as a fire extinguishant in sensitive areas where other agents might cause unacceptable damage, and for use in areas where other extinguishing agents could cause suffocation. Halons are used in both fixed and portable fire extinguishing systems.

Halons are extremely damaging to the ozone layer and as a result their consumption was phased-out by the end of 1993. At that time, there were approximately 3000 tonnes of halons in Canadian fire suppression systems. Chemical alternatives exist but there is no "drop-in" replacement available now or expected to be developed in the near future for the current halon uses. Alternative agents generally require a new system or major modifications to the existing system. There are a large number of halon systems still in service in Canada.

1.2.9 *Pest Control Sector*

This sector involves the use of methyl bromide, a fumigant gas, as a pesticide. Methyl bromide is used to control soil pests prior to planting certain crops and to control stored food pest in the food processing and transportation industries. Canadian methyl bromide consumption is already controlled by Environment Canada's Ozone-Depleting Substances Regulations. Under these regulations, methyl consumption was frozen at 1991 level starting in 1995 and a 25 % reduction comes into effect in 1998. Quantities for quarantine and pre-shipment uses are exempted from controls.

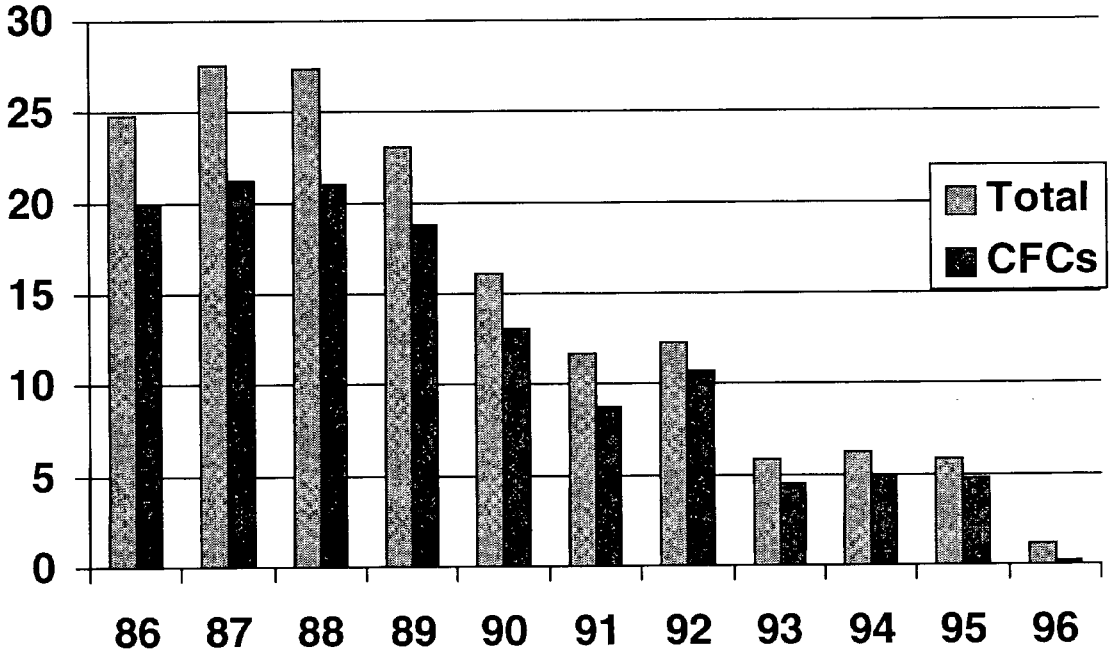
Canada's position is to phase-out methyl bromide consumption in 2001 with the exemption of quarantine and pre-shipment uses. There may be further exemptions for critical agricultural uses where no technically or economically alternatives are available. There is a need for environmental and agricultural authorities to continue working together on this issue.

1.2.10 *Consumption and Inventory*

Canada's historical ODS consumption (production + imports - exports), starting in 1986, is shown in Figure 1. The achievement of reducing ODS consumption by 96% in a ten-year period was made possible through the harmonized actions of all levels of government working in support of commitments made under the Montreal Protocol. There was active cooperation by industry, trade and technical associations with very little industry disruption or overall economic loss. Future consumption concerns will focus mainly on the HCFCs and methyl bromide as the production and import of all other newly produced ODS is now prohibited, except for essential uses.

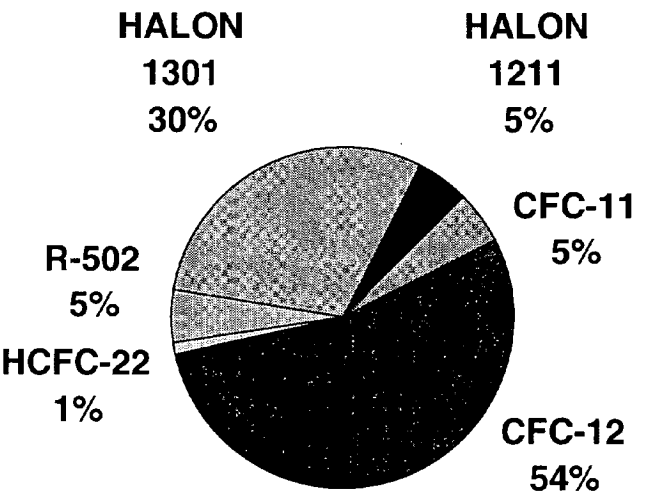
Although the major part of Canada's consumption of ODS has been eliminated, air conditioning, refrigeration and fire suppression systems still contain large quantities of these chemicals. In 1993 an inventory of CFCs and halons indicated there were over 65,000 ozone depletion potential (ODP) weighted tonnes in inventory (see Figure 2), whereas the consumption at that time was only slightly over 5,000 ODP weighted tonnes (see Figure 1).

Figure 1: Canadian ODS Consumption (kilotonnes)



* all quantities are ODP weighted.

Figure 2: CANADIAN 1993 ODS INVENTORY



TOTAL = 65,265 ODP WEIGHTED TONNES

Summary of the Original National Action Plan

2.1 *Objective*

The original National Action Plan (NAP) focused primarily on recovery, recycling, and reclamation of CFCs and HCFCs from refrigeration and air-conditioning systems. It was recognized that recovery, recycling and reclamation (R/R/R) would be essential to an effective emission reduction program, while at the same time ensuring adequate supply as refrigerants became more scarce and costly. The specific objective of the NAP was to reduce CFC emissions by:

- managing existing supplies and thereby reducing demand for virgin CFCs;
- minimizing emissions of CFCs and HCFCs during installation, servicing, and disposal of equipment;
- establishing a regulatory infrastructure for R/R/R of CFCs and HCFCs;
- establishing the practice of R/R/R of CFCs and HCFCs through industry training;
- reducing waste and venting of CFCs from containers.

These components of the key objective were more specifically defined in the form of Tasks. Responsibility for these tasks was specified and a schedule established.

2.2 *Action Plan Tasks*

The original Action Plan Tasks are summarized in Table 1. A high level of harmonization has been achieved between the various jurisdictions, as well as good progress in completion of the specified tasks. The NAP has been a major factor in Canada's ozone protection program. Through effective industry communication and input, a high level of cooperation was achieved and the various tasks were implemented with minimal disruption and economic impact to the marketplace.

The concept of a national R/R/R program has been recognized by the Parties to the Montreal Protocol in 1992 and several other countries have taken similar actions than those taken by Canada.

The introduction of environmental awareness training has provided industry service technicians with the necessary understanding of the ozone depletion problem and its consequences, and has produced an important level of motivation to reduce emissions. The training is now being taught to apprentices and students enrolled in refrigeration and air-conditioning programs in trade colleges.

TABLE 1

SUMMARY OF ORIGINAL ACTION PLAN TASKS AND CURRENT STATUS

NOTE: These tasks focus on the refrigeration industry and CFCs/HCFCs

No.	Title	Schedule	Current Status
1.	**Mandate Recovery Recycle, Reclaim**	**By end of 1992**	**Regulated in all provinces [1] and Yukon**
	Consider Prohibiting CFC Deliberate Release	**By end of 1993**	**Regulated in all provinces [1] and Yukon**
2	**Develop Training Programs**	**July 1991 to Dec. 1992**	**Two national training programs available. Several updates made.**
	Deliver Program	**Oct. 1992 to Oct. 1993**	**Approx. 75,000 service persons trained to date.**
	Administration	**Oct. 1992 to Oct. 1993**	**Administration set up between HRAI and the provinces.**
3	**Revise CEPA Code of Practice for Refrigeration and Air - Conditioning**	**By Sept. 1992**	**Completed.**
4	**Characterize Existing CFC Inventory**	**By Fall, 1992**	**Completed.**
5	**Develop Equipment and Quality Standards**	**Revised**	**See revised Action Plan tasks**
6	**Inform General Public on Issues**	**By mid 1992**	**Several public information brochures issued.**
	Inform Industry	**Ongoing**	**Several stakeholder meetings, information sessions held.**
7	**Revise Government Procurement Standards to Stipulate Recovery and Recycling**	**Jan. 1993 to July 1994**	**On-going**

Draft for federal government facilities. Guidelines in the Northwest Territories.

The New National Action Plan

This new plan incorporates the recommendations made in the "Strengthening Canada's Ozone Layer Protection Program" report. It includes all ODS and halocarbon alternatives. A draft of this plan was circulated to stakeholders for comments in April 1997.

The new NAP has been appropriately titled "National Action Plan for the Environmental Control of Ozone-Depleting Substances and their Halocarbon Alternatives." The experience gained in the original NAP implementation permits similar principles and strategies to be applied to other industry sectors in the revised NAP.

The inclusion of halocarbon alternatives, such as HFCs, in the NAP is a direct result of the "strengthening of the program" report. HFCs were not in general commercial use at the time of the first publication of the NAP. They are now being used to replace CFCs and some HCFCs in refrigeration and other sectors. Although HFCs are not ozone depleting, many of them have a high global warming potential. HFC emissions can be significantly reduced without any industry disruption by using pollution prevention measures such as R/R/R and other measures already in place for ODS, using a preventive and sustainable approach for the alternatives, will ensure that one environmental concern is not exchanged for another. In addition, this create consistency when dealing with ODS and their alternatives in the refrigeration and air conditioning sector.

3.1 *Objectives*

The specific objectives of the new NAP are:

1. To improve the environmental management of all ODS and halocarbon alternatives and to reduce their emissions from all industry sectors by:
   - minimizing emissions during the installation, operation, maintenance, repair, disposal, and decommissioning of systems and equipment;
   - requiring the practice of recovering and recycling to the maximum extent feasible in all industry use-sectors;
   - identifying, where feasible, appropriate dates for the phase-out of specific uses of CFCs and Halons or as alternative, mandate total containment;
   - developing a strategy for the disposal of surplus CFCs and halons;
   - implementing environmental awareness training;
   - supporting the use of non-ODS alternatives.

2. To provide consistency for industry and to minimize the impact on other environmental issues.

3.2 *Revised National Action Plan Tasks*

In order to meet the new needs and objectives outlined in Section 3.1, the original Tasks as shown in Table 1 have been revised. The revised NAP Tasks are listed in Table 2 and include:

- The continuation of original tasks as needed;
- Original tasks that have been expanded to include halocarbon alternatives;
- New tasks in the refrigeration and air conditioning sector to reflect the revised "Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems" and to enhance the recovery of refrigerants;
- New tasks in the halon sector to reflect the "Code of Practice on Halons";
- New tasks focused on other industry sectors to reduce fluorocarbon emissions;
- New tasks to provide basic information necessary for assessing future actions, particularly with regard to the phase-out of uses and disposal of surplus ODS.

The Tasks have been grouped together in accordance with the industry sector to which they apply. These sectors are as follows:

1. General
2. Refrigerants
3. Solvents
4. Fire Protection (Halons)
5. Aerosols, Sterilants, Laboratory Uses
6. Pest Control (Methyl Bromide)
7. Blowing Agents

TABLE 2

REVISED NATIONAL ACTION PLAN TASKS

NO.	TITLE	SCHEDULE	RESPONSIBILITY	PRIOR.
GENERAL				
1	**Prohibit Release, Mandate Recovery ,Limit Dispersive Uses of all CFCs, HCFCs, HFCs**	**End 1999**	**Environment Canada, Provinces/Territories**	**1**
	Mandate Leak Testing and Repair Prior to Top Up of Systems	**End 1999**	**Environment Canada, Provinces/Territories**	**1**
	Evaluate Options for Action on PFCs and Other Halocarbons Alternatives	**End 1998**	**Environment Canada**	**3**
2	**Update ODS, HFC Inventory to 1996**	**End 1998**	**Environment Canada**	**2**
3	**Prepare New Information Package for Public and Industry Prior to Montreal Meeting of Parties to Protocol**	**Sept. 1997**	**Environment Canada**	**2**
4	**a) Discussion Paper on Disposal of surplus CFCs & Halons**	**Mid 1998**	**Environment Canada**	**1**
	b) Development of a Strategic Plan for Disposal of Surplus CFCs & Halons	**End 1999**	**Environment Canada**	**1**

TABLE 2 (CONTINUED)

REVISED NAP TASKS

NO.	TITLE	SCHEDULE	RESPONSIBILITY	PRIOR.
5	**Form Expert Panel(s) on ODS Alternatives**	**End 1998**	**Environment Canada**	**3**
6	**Implement Additional Controls on HCFCs**	**End 1998**	**Environment Canada**	**1**
REFRIGERANTS				
7	**Continue Environmental Awareness Training Program**	**On-going**	**Environment Canada, Provinces/Territories**	**1**
	Update Training Program to Reflect Revised Code of Practice	**Early 1998**	**Environment Canada**	**1**
	Assess Results and Progress of Training Program	**Early 1998**	**Environment Canada**	**2**
8	**Complete a Review of R/R Equipment Standards**	**End 1997**	**Environment Canada**	**2**
9	**Mandate Use of Refillable Containers**	**End 1999**	**Environment Canada, Provinces/Territories**	**1**
10	**Prohibit Recharging Mobile A/C Systems with CFCs as Recommended in Code of Practice**	**Jan. 1, 2000**	**Environment Canada, Provinces/Territories**	**1**
11	**Assess Feasibility of Use Phase-out of CFCs in Refrigeration and A/C Systems**	**Early 1998**	**Environment Canada**	**2**

TABLE 2 (CONTINUED)

REVISED NAP TASKS

NO.	TITLE	SCHEDULE	RESPONSIBILITY	PRIOR.
SOLVENTS				
12	**Assess Feasibility of Eliminating Halocarbon Emissions During Metal and Electronic Cleaning**	**End 1999**	**Environment Canada**	**2**
Fire Protection				
13	**Implement Halon Code of Practice and Identify Regulatory Requirements**	**End 1998**	**Environment Canada, Provinces/Territories**	**2**
14	**Assess Feasibility of Use Phase-out of Halons in Fire Extinguishing Systems**	**Early 1998**	**Environment Canada**	**2**
AEROSOLS, STERILANTS, LAB USES				
15 (a)	**Assess the Use of HCFCs and HFCs in the Aerosol and Sterilants Industry**	**End 1998**	**Environment Canada**	**3**
15 (b)	**Monitor CFCs & HCFCs Use in Laboratory Analysis**	**On-going**	**Environment Canada**	**3**
15 (c)	**Develop Transition Strategy for MDIs**	**Early 1998**	**Environment Canada**	**1**
Pest Control				
16	**Promote Prevention of Emissions and Use of Alternatives to Methyl Bromide**	**On-going**	**Environment Canada, Provinces/Territories**	**2**

TABLE 2 (CONTINUED)

REVISED NAP TASKS

NO.	TITLE	SCHEDULE	RESPONSIBILITY	PRIOR.
BLOWING AGENTS				
17	**Assess Feasibility of Recovery of Halocarbon Blowing Agents During Foam Manufacture**	**End 1999**	**Environment Canada**	**2**

Priority Legend: 1 = Must be done
2 = Highly desirable
3 = Optional

3.3 *General Tasks*

3.3.1 *Task#1*

Prohibit Release and Mandate Recovery of CFCs, HCFCs, HFCs, and All Their Isomers and Blends from Closed Systems and Limit Dispersive Uses.

This is an expansion of the original Task #1, shown in Table 1. The task has been expanded to include HFCs, establish release prohibition requirements and include all industry sectors. The release prohibition applies to systems and uses where it is technically and economically feasible to reduce and eliminate emissions. There are certain uses for which, by their nature, it is impossible to reduce emissions using containment measures (e.g. aerosols, close-cell foams). It is also essential that such dispersive uses be limited where feasible.

Mandate Leak Testing and Repair Prior to Top Up of Systems.

This task covers both the refrigeration and air-conditioning and fire protection sectors. Leaks from systems, including chiller purge systems, originally accounted for about 25% of the total emissions of ODS. Despite the implementation of the original NAP, leaks still account for a high percentage of the total amount of ODS emissions. This is due in large part, to the reduction of the other sources of ODS emissions. It is essential that systems that have lost ODS be leak tested and repaired prior to recharging. This will provide significant benefit to the ozone protection program and reduce operating costs for owners.

Evaluate Options for Action on PFCs and Other Halocarbon Alternatives.

Perfluorocarbons (PFCs) are not ODS but do have a significant Global Warming Potential (GWP). Other halocarbon alternatives, such as chlorocarbons, and hydrochlorocarbons, may have other undesirable environmental impacts, such as contributing to acid rain or smog. Use of these compounds thus requires a careful assessment so that effective management options can be developed and evaluated.

3.3.2 *Task #2*

Update the ODS and HFC Inventory to 1996

This is an extension and expansion of Task #4, listed in Table 1. The original inventory study was very useful in defining the initial needs and determining progress regarding the major use of the main ODS such as CFCs, HCFCs, and halons. The original inventory provided the necessary data for the development of suitable programs to reduce emissions and uses. The updated inventory will include HFCs as well as all ODS. It will not only provide information to be used as a base for future programs, but also will be a clear measure of actual progress in reducing use in the various sectors over the past three years.

3.3.3 *Task #3*

Prepare a New Information Package for Public and Industry Prior to the 9th Meeting of Parties to the Protocol (Montreal, September, 1997).

The September 1997 meeting of the parties to the Protocol will recognize the 10th anniversary of the signing of the original document in 1987, in Montreal. This meeting will provide an opportunity to present a summary of Canadian progress, programs, and our future direction.

Concurrently, there is an important need to provide an updated information package for both Canadian industry and the general public. Information packages have been a key factor in obtaining industry cooperation and suggestions. Important concerns such as HCFC control and phase-out, use of HFCs, possible phase-out of uses in some sectors, etc., require an updated information package. In addition, the new issues, and the future direction require an information package for the general public, to keep them up-to-date. The information package should cover all industry sectors.

3.3.4 *Task #4*

Plan for the Disposal of CFCs and Halons

(a) Discussion Paper on Disposal of Surplus CFCs and Halon

The availability of alternatives for CFCs and for many HCFCs, coupled with the possibility of future use phase-out in some industry sectors, may lead to a surplus of CFCs. A similar situation could also occur with halons. An assessment of this potential problem is required and includes the following elements:

- identification of quantities in use in each sector;
- estimates and projections of future surpluses;
- identification of possible disposal scenarios, such as "natural" phase-out, conversion to other environmentally acceptable compounds, and destruction;
- evaluation of possible advantages and disadvantages of the various scenarios;
- options for future actions;
- discussion of responsibilities for disposal.

(b) Development of a Strategic Plan for Disposal of Surplus CFCs and Halons (if necessary)

The strategic plan would include the following major components:

- a clearly defined objective;
- specified dates for achieving important milestones;
- an action plan defining specific actions and responsibilities;
- a plan to monitor progress.

3.3.5 *Task #5*

Form Expert Panels(s) on ODS Alternatives

For sectors for which a need is identified, expert panel(s) will be established to review ODS alternatives, identify the most promising ones and provide recommendations on how to foster the development or introduction of these products and technologies. The panel will seek input from stakeholders in Canada regarding suggestions for possible replacements. Environmental concerns as well occupational health and safety issues will be included in the mandate of the panel.

3.3.6 *Task #6*

Implement Additional Controls on HCFCs

Further controls on HCFCs will be developed restricting products made with HCFCs where alternatives exist. These controls would also restrict HCFCs to applications currently being met by ODS with higher ODP and control the import of certain equipment containing HCFCs. Dispersive uses of HCFCs will be phased-out by 2010.

3.4 *Refrigerant Sector Tasks*

3.4.1 *Task #7*

Training Program

(a) Continue Environmental Awareness Training Program

The Environmental Awareness Training Program has been a major asset in informing, motivating, and guiding the service industry in reducing ODS emissions. There remains several thousand service technicians across Canada to be trained. In addition, new people entering the various trades require this training.

(b) Update the Training Program to Reflect Revised Code of Practice

The Code of Practice is the main component of the training course. Recently the Code of Practice was revised and updated to reflect the many new developments related to ODS. The training program will be updated to ensure that the latest information, methods, and technologies are provided to the service industry.

(c) Assess Results and Progress of the Training Program

Concurrent with updating the training program, it is necessary to assess the effectiveness of the program. This assessment should provide the information needed to determine the future direction, content of , and control over the training program.

3.4.2 *Task #8*

Complete a Review of Recovery and Recycling (R/R) Equipment Standards

Since the concept of recovery and recycling was introduced, most sectors of the refrigeration and air-conditioning industry are using R/R equipment. The industry's trade and technical associations have established equipment standards to ensure that the R/R needs are met.

There are now several sets of standards. It is therefore essential to examine each one to ascertain whether environmental concerns are adequately addressed. Recommendations for possible future actions may be made following completion of this review.

3.4.3 *Task #9*

Mandate Use of Refillable Containers

Refillable containers are less prone to leakage and they also eliminate emissions caused by disposal of throwaway and recyclable containers. Their use is now mandatory in several provinces. This requirement should be mandated by all jurisdictions in Canada.

3.4.4 *Task #10*

Prohibit Recharging Mobile Air Conditioning Systems with CFCs, as Recommended in the Code of Practice

Mobile air-conditioning is one of the largest sources of CFC emissions in the refrigeration and air conditioning sector. Most vehicles manufactured after 1993 do not use CFCs. Conversion kits and/or alternative refrigerant blends are available for older models. The new Code of Practice recommends that recharging of mobile air conditioners with CFCs be prohibited as of January 1, 2000. This should be mandatory in all jurisdictions in Canada.

3.4.5 *Task #11*

Assess Feasibility of Use Phase-out of CFCs in Refrigeration and Air Conditioning Systems

The current inventory of CFCs exists mostly within the refrigeration and air conditioning sector. Normal replacement of equipment should reduce the amount in use by another 30% by the year 2000. The need to further reduce ODS emissions in order to better protect the ozone layer suggests that phase-out dates for CFC uses must be considered. The feasibility of a use phase-out and appropriate dates should be assessed, with due concern given to socio-economic factors and to the possibility of cost effective containment of CFCs.

3.5 *Solvents Cleaning Sector*

3.5.1 *Task #12*

Assess Feasibility of Eliminating Halocarbon Emissions During Metal and Electronic Cleaning

Most ODS use has been eliminated in this sector because of higher costs or unavailability of supplies created by the production phase-out of ODS. These two factors have forced equipment owners to seek alternatives. In the electronics cleaning sector, there is still some hand cleaning and tabletop equipment cleaning that could be replaced by more environmentally efficient methods and equipment.

A study should be performed to assess this situation and to ascertain to what extent environmental improvements can be made. In most cases, it is suspected that the user would realize cost savings.

3.6 *Fire Protection Sector*

3.6.1 *Task #13*

Implement Halon Code of Practice and Identify Regulatory Requirements

The halon industry sector is highly specialized, and the use of halons, in certain applications reduces risks to humans. With the phase-out of consumption, there is a need to ensure that surplus halon is of acceptable quality and available for use in the remaining systems that still require them. It is equally important that emissions due to poor operation or maintenance be avoided. The new Halon Code of Practice addresses these issues.

This Code of Practice should to be implemented in a harmonized manner across the country. It might be necessary to implement some of the proposed measures, such as banning non-critical uses for which alternatives are adequate, through regulations.

3.6.2 *Task #14*

Assess Feasibility of Use Phase-out of Halons in Fire Extinguishing Systems

The critical factors in assessing the feasibility of such a phase-out are the high ODP of halons and the possible threat to human safety. It may be necessary to assess the various use areas separately, identify critical needs and establish an adequate time frame for conversion from halon use.

The use of halons in some portable systems may be amenable to phase-out in the short term. The time frames would have to be carefully examined, as would the collection and disposal of surplus halons. The feasibility of a use phase-out and appropriate dates should be assessed, with due concern given to socio-economic factors and to the availability of cost effective alternatives to halons.

3.7 *Aerosols, Sterilants, and Laboratory Use Sector*

3.7.1 *Task #15 (a)*

Assess the Use of HCFCs and HFCs in the Aerosol and Sterilant Industry

With the elimination of CFCs from aerosol use in the 1980's, the industry switched to alternative compounds such as hydrocarbons, HCFCs, and HFCs. HCFCs are ODS and HFCs have high global warming potential. Since aerosols are by nature, totally dispersive, it is important to know the extent of their current use and their environmental impact. Other possible alternatives that could replace them should be identified.

In this sector, HCFCs and HFCs are in use or being considered for use. The use of these substances should be assessed in terms of critical need, possible alternatives, and the potential for the uses of recovery and recycling technology.

3.7.2 *Task #15 (b)*

Monitor CFC and HCFC Use in Laboratory Analysis

Use of certain ODS in laboratory analysis results from their low toxicity, non-flammability, and high evaporation rates. Tests using these substances became recognized by various standards organizations. These tests are considered as essential use applications until testing alternatives are identified and proven. These efforts must be monitored to ensure there is progress toward eliminating this use.

3.7.3 *Task #15 (c)*

Develop Transition Strategy for Metered-Dose Inhalers (MDIs)

Environment Canada, in cooperation with Health Canada and appropriate stakeholders, will develop a transition strategy to non-CFC based MDIs. This strategy may contain the following elements: public consultations, public awareness and promotion campaigns, removal from the market of CFC-based MDIs and approval of non-CFC products on a priority basis.

3.8 *Pest Control Sector*

3.8.1 *Task #16*

Promote Prevention of Methyl Bromide Emissions and the Use of Alternatives

Methyl bromide is a fumigant gas that is used as a pesticide in the treatment of soil pests prior to the planting of certain crops, in food processing facilities and in the storage and transportation of agricultural products. Introduction of new pest control

techniques and new pesticides as well as dissemination of information on techniques that do not use methyl bromide will reduce the Canadian methyl bromide consumption. The use of an integrated pest management approach and the introduction of recovery and recycling technology in some applications will also help to achieve lower emissions. Close cooperation with users, applicators, Agriculture and Agri-Food Canada and the Pest Management Regulatory Agency should continue, to encourage the introduction of alternatives.

3.9 *Foam Blowing Agents Sector*

3.9.1 *Task #17*

Assess Feasibility of Recovery of Halocarbon Blowing Agents During Foam Manufacture

Considerable emission of blowing agent takes place during certain foam manufacturing process. During the manufacture of open cell foams, virtually all the actual blowing agent is lost, while for closed cell foams, the emission rate is low . The feasibility of recovery should be assessed to determine if manufacturing systems could lend themselves to economically feasible changes. Environmental benefits and the cost/benefit ratio of such measures should also be evaluated.

Glossary

In this plan, the following definitions apply:

A/C - Air conditioning

CCME - Canadian Council of Ministers of the Environment. Each province and territory, and the federal government are represented at the meetings by the respective Minister of the Environment. Wide ranges of environmental issues are discussed at the meetings.

Chlorofluorocarbon (CFC) - A very stable compound containing chlorine, fluorine, and carbon atoms. Chlorofluorocarbons decompose in the stratosphere and release chlorine, which destroys ozone.

Disposable Container - A container designed to be used only once for transportation or storage of CFCs or HCFCs; designed in accordance with Transport Canada specification 39 (DOT 39 if made in the USA).

Disposal - The method used to eliminate a substance that will no longer be used for the original purpose for which it was made. The method may include transformation, destruction, or disposal as a hazardous waste if mixed with other substances.

FPWG - Federal Provincial Working Group on Controls Harmonization (Ozone-Depleting Substances). The group is responsible for coordinating the development of controls across all jurisdictions for ozone-depleting substances and their alternatives. This group now reports to the National Air Issues Coordinating Committee.

GWP - Global Warming Potential. A relative measure of the warming effect that the emission of a radiative gas might have on the surface troposphere. Usually a factor relative to CO2.

Halon - A compound containing bromine, chlorine, fluorine, and carbon in its structure. Halons have high ODP.

Halocarbon - A carbon-based compound that may contain hydrogen, fluorine, chlorine, bromine or iodine in its structure.

HRAI - Heating, Refrigerating and Air Conditioning Institute

Hydrochlorofluorocarbon (HCFC) - A chemical compound that contains hydrogen, chlorine, fluorine, and carbon atoms. Hydrochlorofluorocarbons are much less stable than CFCs, but small quantities can reach the stratosphere and release chlorine. They are considered acceptable as substitutes for CFCs for a transitional period but because of their low ozone-depletion potential, HCFC production and importation will be phased out by the year 2030.

Hydrofluorocarbon (HFC) - A chemical compound that contains only hydrogen, fluorine, and carbon. Since no chlorine is present, these compounds have no ozone-depletion potential and are good replacements for CFCs, although they have a global warming effect.

Hydrobromofluorocarbon (HBFC) - A compound containing only hydrogen, bromine, fluorine, and carbon atoms in its structure. HBFCs have a higher ODP than CFCs but not as high as halons.

Methyl Bromide (MBr) - A chemical compound containing bromine, hydrogen and carbon. It is a pesticide used as a fumigant.

Montreal Protocol - An international agreement titled "The Montreal Protocol on Substances that Deplete the Ozone Layer." The Protocol sets the reduction and phase-out dates for the consumption of ozone-depleting substances. It was developed under the auspices of the United Nations Environmental Programme (UNEP) to provide a coordinated response to the global problem of ozone depletion. More than 160 countries have signed the Protocol.

Ozone-Depleting Substance (ODS) - A chemical compound that is sufficiently stable to reach the stratosphere and capable of reacting with stratospheric ozone, either directly or through release of a chemical element that reacts after the compound decomposes.

Ozone Depletion Potential (ODP) - The rated effect of a compound on the ozone layer compared to CFC-11, which is assigned the value of 1.0. Official ODP values is assigned in the Montreal Protocol.

Perfluorocarbon (PFC) - A chemical compound that contains only fluorine and carbon. PFCs are not ODS. They do however have a high global warming potential. They may be a substitute for CFCs and HCFCs if lower GWP compounds are not available.

Recovery - Collection of ODS such as CFCs or HCFCs from equipment during servicing or before disposal (as opposed to venting to the atmosphere).

Recycling - Reuse of recovered ODS by charging back into the equipment after servicing. The ODS goes through some cleanup procedures before return, e.g., filtering, drying. This is usually done at the job site, but may be done off-site, depending on the volume.

Reclamation - Recovered refrigerants are shipped off-site to a central processing facility and cleaned by filtering, drying, distillation, and chemical treatment to meet or exceed industry accepted reuse standards. Results are verified by laboratory analysis.

Refillable Container - A container that meets the requirements of Transport Canada and is approved for multiple use.

R/R - Recovery and Recycling.

R/R/R - Recovery, Recycling, and Reclamation.