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Canada's Strategy to Accelerate the Phase-Out of CFC and Halon Uses and to Dispose of the Surplus Stocks



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***Prepared by:
Federal-Provincial Working Group
on Ozone-Depleting Substances
and Their Halocarbon Alternatives***

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Abstract

The Federal-Provincial Working Group on Ozone-Depleting Substances and Halocarbon Alternatives has developed a Strategy to achieve an orderly and affordable phase-out of CFCs and Halons in Canada. The Strategy takes into account the input received during extensive consultations with stakeholders. Initiatives have been identified to provide the infrastructure needed to encourage an orderly transition from CFCs and Halons to alternative substances and technology, and to ensure safe disposal of surplus stocks. Phase-out objectives and approaches specific to individual industry sectors are presented. The costs and benefits associated with implementation of the Strategy are also presented.

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Executive Summary

Canada is committed to protecting the earth's ozone layer. In the last decade, the federal and provincial governments have taken action to ensure that Canada's national objectives and all obligations under the Montreal Protocol on Substances that Deplete the Ozone Layer are met or exceeded. However, a comprehensive review in 1994-95 of Canada's Ozone Layer Protection Program determined that unless new initiatives are put in place to take CFCs and Halons out of service and dispose of them, most of the Canadian inventory of these substances will ultimately be released to the environment.

The Federal-Provincial Working Group on Ozone-Depleting Substances and Halocarbon Alternatives (FPWG) has developed this Phase-out Strategy in response to that observation. The objective of the Strategy is to minimize and avoid the ultimate release of designated substances to the environment. Extensive consultations with stakeholders have been a key part of the Strategy development. The FPWG expects that implementation of the Strategy will achieve an orderly and affordable phase-out of CFCs and Halons in Canada.

The Strategy consists of specific approaches to phase out uses of CFCs and Halons and dispose of surplus substances. There are two separate components to the Strategy. The first component consists of initiatives that are general in nature. They will provide the "infrastructure" needed to encourage an orderly transition from CFCs and Halons to alternative substances and technology, and to assure safe disposal of the surplus stocks of CFCs and Halons. The second component consists of phase-out objectives and approaches that are specific to individual industry sectors. A sector-by-sector approach is needed because each sector is unique (not "one size fits all") and the Strategy will reflect what can be achieved in each sector.

The "general" component of the Strategy addresses four separate areas: extended producer responsibility (EPR); market force instruments; disposal of surplus stocks; and control measures. The second component of the Strategy addresses six specific use sectors: mobile air conditioning; mobile refrigeration; household appliances; commercial refrigeration and air conditioning; chillers; and Halons.

The cost-benefit analysis conducted as part of this work has concluded that the overall health and environmental benefits to Canadians upon implementing the Strategy will exceed the implementation costs for each of

the sectors. The total net present value of the Strategy is in the order of a positive \$2 billion to Canadian society.

Section 1

Introduction

This report describes the Strategy that the Federal Provincial Working Group on Ozone Depleting Substances and Halocarbon Alternatives (FPWG) has developed to achieve an orderly and affordable phase-out of remaining CFC and Halon uses in Canada. The objective of the Strategy is to minimize and avoid the ultimate release of CFCs and Halons to the environment. The Strategy will accomplish this by accelerating the use of alternatives and rendering surplus stocks of CFCs and Halons harmless.

This Strategy is part of the ongoing process of fulfilling Canada's commitment to protect the earth's ozone layer. Development of the Strategy came about as a result of a comprehensive review, started in 1994, of the Canadian ozone layer protection program. That review helped to point out that unless new initiatives are put in place to take CFCs and Halons out of service and dispose of them, most of the Canadian inventory of these substances will ultimately be released to the environment. The Auditor General of Canada reinforced this point in the 1997 audit of the national ozone layer protection program and called for action to address it.

Extensive consultations with stakeholders have been a key part of the development of this Strategy. Consultation sessions focusing on a proposed Strategy prepared by the FPWG were held during February in Vancouver, Winnipeg, Halifax, Montreal, and Toronto. In all, approximately 200 people participated in these sessions. Reports summarizing the consultations and the responses of the FPWG to the recommendations from the consultations are available under separate cover.^{1,2}

Canada is not alone in developing approaches to accelerate the phase-out of uses of ozone-depleting substances (ODS). Other countries are taking similar steps. For example, the European Union is planning to ban the refill in commercial refrigeration and air conditioning equipment with CFCs by the end of 2000. Sweden, Denmark, Norway, and Finland prohibited the use of CFCs in new equipment in the early '90s. Sweden prohibited recharging of existing equipment with CFCs in 1998, and plans to prohibit the use of CFC refrigerants in existing commercially used equipment in 2000.

¹ Synthesis Report – Public Consultations on Canada's Proposed Strategy to Accelerate the Phase-out of Ozone-depleting Substances, CANTOX ENVIRONMENTAL INC., March 31, 2000

² Canada's Proposed Strategy to Accelerate the Phase-out of CFC and Halon Uses and to Dispose of the Surplus Stocks: Response to Recommendations from Stakeholder Consultations held during February, 2000, Federal-Provincial Working Group on Ozone-Depleting Substances and Halocarbon Alternatives, July, 2000

Action to accelerate the phase-out of uses of CFCs and Halons is also being taken under the Montreal Protocol. The Canadian Strategy will meet Canada's new obligations in these areas:

- At the 10th Meeting of the Parties to the Montreal Protocol, the Parties requested signatories to develop national and regional strategies for the management of Halons, including emissions reduction and ultimate elimination of their use, to be submitted by July 2000;
- At the 11th Meeting of the Parties to the Montreal Protocol, a decision was adopted on the management of CFCs. All non-Article 5 countries (i.e. all developed countries) are to prepare strategies for the management of CFCs, including options for recovery, recycling, disposal, and eventual elimination of their use. These management strategies are to be prepared by July 2001.

1.1 Background

1.1.1 Impact of Ozone Depletion

The science of ozone depletion is well established and accepted as a result of many years of collaborative research by scientists around the world. Anthropogenic releases of certain halogenated compounds, in particular CFCs and Halons, take part in reactions in the stratosphere that destroy the stratospheric ozone. Since the stratospheric ozone layer functions to reduce the amount of UV-B radiation that reaches the earth, the reduction in ozone layer results in increased levels of UV-B radiation reaching the earth's surface.

Human exposure to the increased UV-B radiation has led to an increase in sunburn, skin cancer and weakening of the immune system. Ecosystem health has also been adversely affected as well. Plankton populations in the oceans (one of the main building blocks of the food chain) have been reduced, and damage to vegetation and crops also occurs.

A study prepared for Environment Canada for the 1997 Meeting of the Parties to the Montreal Protocol estimated the global costs of ozone depletion to be in the range of \$235 billion per year.³

1.1.2 Canadian Ozone Layer Protection Program

In Canada, the federal and provincial governments share regulatory responsibility for ozone layer protection. The federal government is responsible for implementing controls needed to meet Canada's obligations

³ The Right Choice at the Right Time, Highlights of the Global Benefits and Costs of the Montreal Protocol on Substances that Deplete the Ozone Layer, Environment Canada, 1997

under the Montreal Protocol, and for regulating federal facilities which are not covered by provincial regulations. The provincial governments control recovery, recycling and the releases of ozone-depleting substances.

Currently, the federal government has prohibited new uses of CFCs and Halons and has restrictions on the import and export of bulk shipments, and on certain uses. There are also federal ODS regulations (covering releases, recovery, etc.) that apply to federal facilities and undertakings. The provinces restrict emissions of CFCs and Halons, and mandate recovery. Some provinces have banned the refilling of automotive air conditioning systems with CFCs. In all jurisdictions, it is prohibited to vent CFCs or Halons (except to extinguish a fire).

The Federal-Provincial Working Group was established in 1989 by the Canadian Council of Ministers of the Environment. The goal of the Working Group was to establish a coordinated national Strategy to eliminate CFCs and Halons in Canada. Over the years, the Group's mandate has remained essentially unchanged, although its scope has broadened in concert with changes to the Montreal Protocol and other environmental issues. The Working Group reports to the National Air Issues Coordinating Committee.

The 1995 review of the Canadian ozone layer protection program and the resulting report entitled *Strengthening Canada's Ozone Layer Protection Program* established the current direction for the Canadian program. The review's main recommendations to minimize releases of CFCs and Halons were:

- Zero-release target dates should be set and met by a combination of total containment and elimination of uses;
- The destruction or transformation (to other chemicals) of unnecessary ODS should be required as soon as feasible;
- The development of new disposal technology should be supported;
- Governments should work in partnership with industry and other stakeholders to facilitate disposal; and
- Market force instruments to promote removal from service and proper disposal should be investigated.

In addition, the Office of the Auditor General of Canada issued a report in 1997 on Canada's Ozone Layer Protection Program, with one of the key recommendations being that the federal government should clearly articulate its position on the destruction of ODS and related equipment.

The Working Group incorporated the results of the “strengthening” exercise into a revised National Action Plan (NAP) in 1998.⁴ The revised NAP is the framework for the continued coordination of federal and provincial and territorial efforts to control and manage ODS in Canada. The following specific objective in the NAP deals with phase-out of uses and disposal of CFCs and Halons:

“To improve the environmental management of all ODS and halocarbon alternatives and to reduce their emission from all industry sectors by:

- Identifying, where feasible, appropriate dates for the phase-out of specific uses of CFCs and Halons, or as an alternative, mandate total containment; and
- Developing a Strategy for the disposal of surplus CFCs and Halons.”

As a first step in achieving this NAP objective, Environment Canada commissioned a review of the options available to manage surplus CFCs and Halons.⁵ This review formed the basis for the proposed Strategy document⁶ prepared by the Working Group in January 2000 and used as the focus for the public consultations carried out in February.

1.2 *Inventory of CFCs and Halons*

The estimated amounts of available CFCs and Halons, based on 1998 information⁷, are shown in Figures 1 and 2, respectively.

⁴ National Action Plan for the Environmental Control of Ozone-Depleting Substances and their Halocarbon Alternatives, Canadian Council of Ministers of the Environment, Report No. CCME PN 1291, January 1998

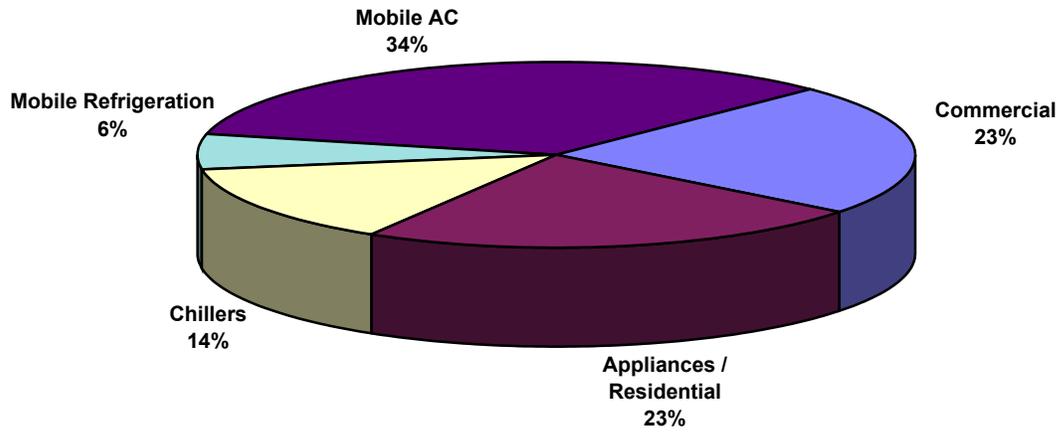
⁵ Options for the Management of Surplus Ozone-Depleting Substances in Canada, Shapiro & Associates, June 1998

⁶ Canada's Proposed Strategy to Accelerate the Phasing-Out of CFC and Halon Uses and to Dispose of the Surplus Stocks, Federal-Provincial Working Group on Controls Harmonization-ODS, January 14, 2000

* Quantities are not ODP weighted

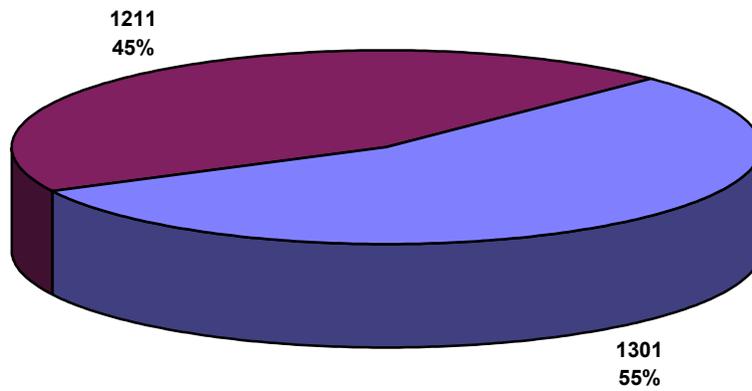
**This total does not include imports of Halons in finished products.

Figure 1: Canadian 1998 CFC Inventory



Total: 22,863 tonnes*

Figure 2: Canadian 1998 Halon Inventory**



Total: 3,130 tonnes*

* Quantities are not ODP weighted

** This total does not include imports of Halons in finished products

Section 2

Phase-out Strategy

The Strategy consists of specific approaches for the phase out of uses of CFCs and Halons and disposal of surplus substances. There are two separate components to the Strategy. The first component consists of initiatives that are general in nature. They will provide the “infrastructure” needed to encourage an orderly transition from CFCs and Halons to alternative substances and technology, and to assure safe disposal of the surplus stocks of CFCs and Halons. The second component consists of phase-out objectives and approaches that are specific to individual industry sectors. A sector-by-sector approach is needed because each sector is unique (not “one size fits all”) and the Strategy will reflect what can be achieved in each sector.

The “general” component of the Strategy addresses four separate areas:

- extended producer responsibility (EPR);
- market force instruments;
- disposal of surplus stocks; and
- control measures.

The EPR initiatives will underwrite disposal costs, thereby ensuring that disposal costs do not contribute to illegal releases or unsafe disposal practices. Economic incentives (e.g. accelerated capital cost allowances) and other market force instruments are being examined, as a way of encouraging transition to alternatives in an orderly manner. Work under the third area will be aimed at actively supporting the development of disposal programs. The last general area of initiatives (Control Measures) will ensure that there is a clear, comprehensive and consistent regulatory framework in place, to ensure there is a “level playing field” for industry to work under.

The second component of the Strategy sets a phase-out approach for six specific use sectors:

- mobile air conditioning;
- mobile refrigeration;
- household appliances;
- commercial refrigeration and air conditioning;
- chillers; and
- Halons.

2.1 General Issues

2.1.1 Extended Producer Responsibility

Approach:

- (i) **Industry will play a key role in the development of management strategies to phase-out, collect and dispose of surplus ODS in Canada, including:**
- **Development of management plans for retrofitting, converting or replacement of existing systems using CFCs and Halons;**
 - **Research and Development of alternative products and technologies; and**
 - **Partnering with government and other stakeholders to develop management plans for collection and disposal of surplus stocks.**

Current Activities:

- The Heating, Refrigeration and Air Conditioning Institute (HRAI) has proposed a plan for the collection and disposal of surplus refrigerants in the stationary refrigeration and air conditioning and chillers sectors, funded by a voluntary industry levy on replacement refrigerants. Other groups are also considering making similar proposals.

Next Steps:

- HRAI will take the lead in developing the program they have proposed. The FPWG and interested stakeholders will participate as appropriate.
 - Other sectors (e.g. mobile air-conditioning and refrigeration, Halons) will be encouraged to participate in such initiative or develop their own EPR program.
- (ii) **Government, industry and training institutes will cooperate on: education and communication activities on available alternative technologies and products; communicating the objectives and timelines of the Strategy; and training of technical personnel.**

Current Activities:

- The environmental awareness and training program for refrigeration and air conditioning service technicians will continue. This program is well established and involves participation of HRAI, the Refrigeration Service Engineers Society (RSES), community colleges, and the

federal and provincial governments. Over 95,000 technicians have taken the training program since its inception in 1992.

- Environment Canada is preparing an ODS Disposal Guide to compliment the Disposal Guidance Document⁸ in order to assist owners of ODS in their disposal decisions.

Next Steps:

- The Multistakeholder Working Group for ODS and Alternatives will be asked to examine the need to undertake development of education/communication materials dealing with available alternative technologies and products.
- Environment Canada, the Provinces and Territories will develop awareness programs to inform stakeholders of the Strategy's objectives and timelines.

2.1.2 Market Force Instruments

Approach:

- (i) *Environment Canada to examine what economic incentives would be appropriate to achieve the objectives of the Strategy, and how to implement these incentives.***

Current Activities:

- Environment Canada is studying potential economic incentives, as described in the recommendation above.

Next steps:

- The FPWG will undertake consultations with other government departments, both federal and provincial, and with stakeholders on the findings and recommendations of the study, with a view to having appropriate market force instruments implemented in Canada.

⁸ Guidance Document on Disposal Technologies for Ozone-Depleting Substances (ODS) in Canada, CANTOX ENVIRONMENTAL INC., March 2000

(ii) Industry-funded programs to be considered for inclusion in management plans for collection and disposal of surplus stocks.

Current Activities:

- The HRAI initiative, described above, should achieve essentially the same results.

Next Steps:

- Further development and implementation of the HRAI-led initiative.
- Expansion to other sectors, e.g. Halons.

(iii) Manufacturers and distributors of alternatives to consider providing incentives such as rebates on new equipment being sold or installed.

Next Steps:

- The FPWG will encourage manufacturers and distributors of alternatives to provide incentives or take other actions to accelerate the transition to alternatives.
- The FPWG will periodically monitor the rate of equipment retrofits and replacements, and reasons for them.

2.1.3 Disposal of Surplus Stocks

Approach:

- ***Governments will partner with private-sector organizations to support initiatives leading to the development of environmental and cost effective disposal program(s).***

Current Activities:

- The HRAI is leading an initiative to dispose of surplus CFCs from the stationary refrigeration and air conditioning and chillers sectors, as described earlier.
- An ODS Disposal Guide is being prepared by Environment Canada.

Next steps:

- Further development and implementation of the HRAI and other industry level initiatives.
- Expansion of the program to other sectors.

2.1.4 Control Measures

Approach:

- ***Governments to work together to provide clear and comprehensive control measures that are consistent from jurisdiction to jurisdiction in implementing the Strategy.***
- ***The export of surplus CFCs and Halons will be prohibited except for destruction and critical uses using the evaluation criteria of the Montreal Protocol.***

Current Activities:

- FPWG continually examines and recommends adjustments to control measures in Canada to improve consistency.
- The Sector approaches in Section 2.2, below, identify the necessary control measures.
- Two jurisdictions, B.C. and Yukon, currently have “seller take back” provisions in their regulations.

Next Steps:

- Governments to develop the necessary control measures to implement the Phase-out Strategy.

2.2 Sectors

2.2.1 Mobile Air Conditioning

Approach

- ***Prohibit refill of mobile air conditioning equipment with CFCs as soon as possible.***

Current Activities:

- Alberta, British Columbia, New Brunswick, the Yukon territory, and the federal government have developed control measures that prohibit refilling of mobile air conditioning equipment with CFCs.
- The Canadian Environment Protection Act (CEPA) Code of Practice⁹ contains guidelines for recovering CFCs from mobile air conditioning equipment.

Next steps:

- Remaining provinces and territories to develop control measures to prohibit the refill as per the CCME National Action Plan on ODS and their Halocarbon Alternatives.

2.2.2 Mobile Refrigeration

Approach:

- ***Prohibit refilling in the Mobile Refrigeration Sector with CFCs effective 2003.***

Current Activities:

- CEPA Code of Practice contains guidelines for recovering CFCs from this sector.
- Companies in this sector are actively converting from CFCs to alternatives.

Next steps:

- Governments to develop the appropriate control measures.
- Management programs for disposal of surplus CFCs to be developed and integrated with the stationary equipment program.

⁹ Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems, Environmental Protection Series, Environment Canada, March 1996

2.2.3 Household Appliances

Approach:

- **Add a ban on converting equipment to use CFCs (R-12) to existing regulatory approach.**
- **Enhance implementation of recovery programs.**

Current Activities:

- An ODS disposal guide is being developed by Environment Canada.

Next steps:

- The FPWG to monitor / report on success of recovery programs.
- The FPWG to consider how to improve existing recovery programs.

2.2.4 Commercial Refrigeration and Air Conditioning

Approach:

A staged refill ban effective by year:

- **Small commercial units (< 5 HP): 2004**
- **Medium units (5 – 30 HP): 2005**
- **Large industrial units (> 30 HP): 2006**

Current Activities:

- The HRAI led initiative for disposal of surplus CFCs applies to this sector.

Next steps:

- Development and implementation of HRAI initiative.
- Development of appropriate control measures.

2.2.5 Chillers

Approach:

- **Beginning in 2005, require conversion or replacement of CFC-containing chillers at next overhaul.**

- ***Beginning in 2003, limit the releases of CFCs from low pressure chiller purges to less than 0.1 kg/kg of air.***

Current Activities:

- The HRAI led initiative for disposal of surplus CFCs applies to this sector.
- Purge limits are already in place in eight jurisdictions, with Alberta, British Columbia, Yukon, and the federal government already mandating 0.1 kg/kg air.

Next steps:

- Development and implementation of the HRAI initiative.
- Development of appropriate control measures.

2.2.6 Halons

Approach:

- ***Prohibit refilling of portable equipment by 2003, except for critical uses.***
- ***For fixed systems, provide for one refill between 2005 and 2010. The refill would be allowed on the condition that the system is replaced by an alternative within a year of the refill. This would also be subject to critical use exemptions. Starting in 2010, refills will be prohibited.***

Current Activities:

- British Columbia, Alberta, Manitoba, Ontario, New Brunswick, the Yukon Territory, and the federal government have, or are developing, control measures to prohibit the refilling of portable extinguishers.
- New Brunswick prohibits refilling of fixed systems, similar to the approach above.

Next steps:

- Remaining jurisdictions to develop and implement the necessary control measures.

Section 3

Implementation Activities

In order to clarify the actions needed by each level of government, the FPWG has updated the current NAP and has identified the tasks required to implement the Strategy.

To ensure consistent implementation of the Strategy, the FPWG will prepare an Implementation Report on the status of the tasks associated with the Strategy. The report will be submitted to CCME on a regular basis.

Section 4

Costs and Benefits

A cost-benefit analysis was conducted by Environment Canada to support the development of this Strategy.¹⁰ The analysis investigates the economic implications of accelerating the phase-out of CFCs and Halons and the disposal of surplus stocks. Equipment targeted by the disposal Strategy includes:

- Large Building Air Conditioning (Chillers);
- Commercial/Industrial Refrigeration;
- Mobile Refrigeration;
- Halon 1211 Portable Fire Extinguishers; and
- Halon 1301 Total Flooding Systems.

A detailed discussion of the assumptions, options investigated and results are included in the Environment Canada Cost-Benefit report. Detailed results for the options investigated are shown in Table 1. The date presented in the option column of Table 1 is the year that the phase-out starts. The low and high values in Table 1 reflect uncertainty in the cost and benefit estimates and bounds where the mean value, or expected Net Present Values (NPV), falls within. The expected value was estimated using Monte Carlo sampling (statistical risk and uncertainty testing) which reflects uncertainty in key input variables in the NPV estimate. The expected NPV, therefore, provides an indication of the most likely outcome in terms of costs versus benefits of each of the options.

The NPV for the options analyzed for each of the sectors are positive. Overall, the expected net present value for the approaches selected for this Strategy is approximately \$2 billion.

¹⁰ Cost-Benefit Analysis for a Ban on CFCs and Halons, Regulatory and Economic Analysis Branch, Environment Canada, July 2000

**Table 1*: Net Present Value for Options Investigated
@ 5% discount rate (\$millions - 2000)**

Option	Low NPV	Expected NPV	High NPV
1. <i>Chillers 2005 Convert at Overhaul</i>	\$(19.30)	\$189.43	\$561.42
2. <i>2005 Retrofit of Commercial/Industrial Refrigeration</i>	\$(176.47)	\$174.17	\$770.16
3. <i>2003 Retrofit of Mobile Refrigeration</i>	\$(9.84)	\$14.56	\$58.58
4. <i>2003 Replacement of Halon 1211 Portable Fire Extinguishers</i>	\$18.55	\$347.79	\$950.81
5. <i>2005 Replacement of 1301 Total Flooding Systems</i>	\$(51.05)	\$1,666.85	\$4,783.95