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TABLE RONDE NATIONALE SUR L'ENVIRONNEMENT ET L'ÉCONOMIE

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ACHIEVING ATMOSPHERIC QUALITY OBJECTIVES THROUGH THE USE OF ECONOMIC INSTRUMENTS

ACID DEPOSITION

GROUND-LEVEL OZONE

GREENHOUSE GASES

A FINAL REPORT OF THE
ECONOMIC INSTRUMENTS COLLABORATIVE
OCTOBER 1993

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NATIONAL ROUND TABLE ON THE ENVIRONMENT AND THE ECONOMY

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DECLARATION

The Economic Instruments Collaborative has members from both environmental groups and the business community in Canada. We established the Collaborative out of our shared view that economic instruments have the potential to contribute to the achievement of environmental goals and economic efficiency. We came together with the common purpose of exploring, through frank discussion in a multi-stakeholder process, the potential for the contribution of economic instruments to address Canada's air quality challenges. The federal and provincial governments participated in our work through their valuable role as observers and advisors.

In our work together, we have engaged in dialogue and debate, in issue identification, problem solving and in writing. As we learned together and from each other, we have reaffirmed and strengthened our commitment to the value of the collaborative process in which decisions are arrived at by consensus and all members are assured equitable participation. Even though agreement was not reached on all issues, our views have changed as a result of our work and we will all promote the consensus we have reached.

One of our first tasks was to express the principles that are the basis of the Collaborative's work. These guiding principles are endorsed by all members of the Economic Instruments Collaborative and are reflected in our report. They represent new common ground among a diverse group of stakeholders and are the foundation upon which we will continue to build.

We selected three specific air issues which varied substantially in their nature, significance and complexity as a means of examining the potential role of economic instruments. We did not debate the goals associated with these specific air issues nor the relative priority of addressing the issues. We will commit to using the results of the work of our Collaborative, which includes our three task groups on acid deposition, ground-level ozone and climate change, as a basis for broader discussion. We found the multi-stakeholder collaborative format provided an effective venue for discussion, debate and joint learning. We recommend it to others.

We believe that the balanced voice of the Economic Instruments Collaborative, representing environmental groups and industry sectors, will be heard and will influence the development of public policy. We hope that our experience can advance models for a new way of doing business that will change perspectives and accelerate progress. We are resolved to continue building partnerships in the pursuit of the most efficient means of achieving environmental goals. Economic instruments represent, in our view a significant opportunity for Canada to integrate economic efficiency and environmental protection.

ECONOMIC INSTRUMENTS COLLABORATIVE
Members and Representatives

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Facilitator	George Kupfer, Fresh Start
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Ann Coxworth (Saskatchewan Environmental Society)	Ann Coxworth

In addition, the Members of the Collaborative wish to thank the following government representatives for their valuable contributions as observers to the process:

Alberta Energy/CCME	Bob Mitchell
B.C. Environment/CCME	Michele McLachlan
Industry, Science & Technology Canada	Guy Ethier, John Dauvergne
Finance Canada, Environment Energy and Resources	Ron Edwards, Barb Jordan
Environment Canada, Atmospheric Environment Service	Robert Hornung
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EXECUTIVE SUMMARY

"Sustainable development" has become a common phrase since the release of the Brundtland Report in 1987. It has dozens of definitions, but the essence of sustainable development is ensuring that present and future human needs are met in a manner that is sustainable both environmentally and economically. This is leading many people to the conclusion that we need to re-examine our approaches to both economic development and environmental protection.

The traditional approach to the latter has been commonly referred to as "command and control." The regulator, acting on society's behalf, sets the emissions standards (that is, issues the command), then endeavours to ensure compliance by enforcing these standards through regulations, licences, and other means (the controls). There may or may not be flexibility in how a company or industry is allowed to meet these standards.

Historically, "the environment" was considered a free good, owned by no one yet available to all; charges for its use were not part of the cost of doing business. Nevertheless, it is now apparent that there *are* costs to society as a whole when the environment is damaged, and that "command and control" approaches may not always be the most efficient and effective ways to reach the broader environmental goals that we as a society may set.

By sending the right signals and with the right structures in place, it is possible to use the market to accomplish the broader societal goals of environmental protection and pollution control. It is important to remember that these economic instruments are merely tools; they can use market signals to influence behaviour and thus accomplish environmental goals, but they do not themselves have any role to play in determining what these goals should be. This responsibility remains in the public domain and it is essential that the public, either directly or through its elected representatives, continue to assess progress toward reaching the goals, and ensure that appropriate course corrections are made. Economic instruments represent one promising approach to reaching these goals. They provide an opportunity to achieve environmental goals at a lower overall cost, increasing economic efficiency.

Formation of the Economic Instruments Collaborative

The Economic Instruments Collaborative (EIC) is a multi-stakeholder body interested in testing the application of economic instruments to air quality issues in Canada. The Collaborative has been investigating the principle that well-designed economic instruments may achieve society's environmental goals more efficiently than have traditional regulatory approaches.

The EIC was formed in 1992. It resulted from discussions among environmental groups and members of the business community who believed there had to be more efficient ways to protect the environment and maintain a healthy economy at the same time. The Collaborative decided to focus on the application of economic instruments to three separate atmospheric issues: acid deposition, ground-level ozone, and global climate change.

Members of the EIC came from the business community, the environmental community, and the

National Round Table on the Environment and the Economy. Several departments of the federal government as well as the governments of Alberta and British Columbia were represented by observers. Eight principles guided the work of the Collaborative and were fundamental to the success of the working groups. Following the release of its reports, the EIC will continue to be a focus for educating and communicating with stakeholder organizations about the application of economic instruments.

The Issues

While recognizing that there are many diverse compounds that contribute to atmospheric problems, a few key gases have been the subject of national and international discussion, resulting in some commitments to action.

The EIC established three working groups to examine how the market could be used to address three particular atmospheric issues:

- the Acid Deposition Group looked at reducing acid deposition due to sulphur dioxide (SO_2);
- the NO_x/VOC Group considered approaches to reducing ground-level ozone by focusing on the role of nitrogen oxides and volatile organic compounds; and
- the Climate Change Group examined greenhouse gases, in particular carbon dioxide (CO_2).

Each of these groups was faced with unique circumstances posed by the problems of production and management of the respective gases. In recognition of these factors, each working group stressed the need for integrated strategies to deal with these issues. As well, each group recognized the necessity for multi-stakeholder involvement in the ultimate design and implementation of economic instruments. Finally, in light of the rapidly developing body of knowledge about atmospheric chemistry and the potential for interjurisdictional cooperation, each group identified a number of areas in which additional work is needed.

The Acid Deposition Group

Emission trading, by establishing a cap on allowable emissions and by abating pollution on a least-cost basis, offers a significant opportunity for meeting society's goals of environmental protection and economic efficiency. In an emission trading regime, those who can control emissions more cheaply than others will sell excess pollution allowances at a profit, while those for whom control is more costly will purchase allowances. Total emissions are restrained, the costs of pollution are internalized, and emission reductions are made on a least-cost basis.

The Acid Deposition Group found that economic instruments have applicability to the acid deposition problem, and that an emission trading system would be best suited to sulphur dioxide (SO_2) control.

The report of the Acid Deposition Group describes a detailed emission trading program, including cap setting, allocation of pollution allowances, trading rules, monitoring, performance rules and enforcement.

The Acid Deposition Group recognizes that further refinement of its proposed emission trading program and resolution of some outstanding public policy issues regarding emission trading will best be achieved through broad public discussion in the context of possible implementation in a specific region.

Thus the Group recommends initiation of public discussion regarding implementation of a demonstration project for SO_2 emission trading in Canada. Alberta is particularly well positioned as an area for a demonstration project, although the emission trading program the Group proposes

could be implemented in any jurisdiction. The design recommendations outlined in the report should be used as a starting point for such public debate.

Components of the proposed trading program include:

- design and management of a cap (that is, the upper limit of allowable emissions) based on environmental criteria;
- allocation and trading of shares (an allotment of the program cap) and coupons (a permit to emit one tonne of SO_2), such that the cap is not exceeded and emission control investments are made on a least-cost basis;
- allocation of a small number of shares to government enabling it to influence annual coupon prices and emissions levels;
- multi-stakeholder involvement in the establishment and management of the emissions cap and the government share allocation;
- comprehensive monitoring, enforcement and performance requirements, including operating terms and conditions specified in each point source's Licence to Operate;
- penalties in the form of significant fines and commensurate emission reductions if a firm emits more tonnes of SO_2 than its coupons holding allows; and
- permission to bank coupons, allowing a company to save unused coupons from one period and apply them to emissions in a later period. In other jurisdictions, similar provisions have accelerated abatement schedules and reduced abatement costs.

The NO_x/VOC Group

Faced with the complex issue of ground-level ozone, this Group drafted a step-by-step process for the development of an ozone control strategy that could be used in any provincial or regional jurisdiction. This Group also devoted its attention to the design of an emission trading program to control nitrogen oxide emissions from permitted stationary sources, along similar lines to the proposed trading program of the Acid Deposition Group. Whereas environmental damage from SO_2 is cumulative, ozone damage occurs during short episodes measured in hours or days, after which ozone breaks down into oxygen. This distinction becomes important in a discussion of issues such as banking of coupons, as proposed under a trading program. Another consideration is the difficulty of quantifying and verifying NO_x emissions as they are both numerous and diverse.

The decision to investigate a trading program for NO_x emissions was made in part because trading programs are already under consideration in jurisdictions such as Ontario, and because recent scientific studies seem to indicate that control of NO_x rather than VOCs ought to be emphasized. Preliminary indications are that large economic efficiency gains are possible under a NO_x trading program. Trading schemes are based on the principle that allocations are better effected by the market than by bureaucratic planning, and that the appropriate role of government is to set fair conditions within which the market can operate.

The environmental representatives in the Group believed that three important prerequisites would have to be fulfilled before they could recommend the introduction of a trading program to control ground-level ozone. These prerequisites included a comprehensive ozone control strategy, a careful evaluation of alternative control instruments, and an accurate emissions inventory. While other members of the Group agreed these were important issues, they believed the concerns could be addressed at the front end of a pilot or demonstration project for the use of economic instruments for NO_x/VOC control; possible pilot sites are the Greater Vancouver Regional District and Ontario.

The main recommendation of the NO_x/VOC Group was that in cases where governments are considering trading programs for stationary NO_x emissions, its report, and the design criteria therein, be considered a guideline in the development of a specific program.

The Group's overall approach to program design was similar to that of the Acid Deposition Group, including the following points:

- the cap and cap reduction schedule should be regionally targeted;
- coupons (the permits to emit NO_x) should be transferable; and
- a futures market should not be precluded, and may accelerate trading.

The Group did not reach consensus around the matter of "banking." Environmental group representatives were concerned that banking could result in large accumulations of NO_x emissions that could be legally emitted later on. Without adequate safeguards, this could result in environmentally damaging episodes of high ozone, even within a declining cap program. The industry representatives viewed banking as a critical component of an effective trading program, providing flexibility and creating incentives to reduce emissions. They were concerned that restrictions on the use of banking could prevent the environmental benefits that would result from firms advancing their control schedules.

Because summer emissions of ozone precursors are so important, the Group thought that seasonal differentials in the value of coupons might be useful in achieving the overall reduction strategy. Controlling emissions in peak episodes is different from seasonal controls, and the Group recommended that further research is needed on possible solutions to this issue.

The Group also identified a number of areas that need additional study and resolution. Among the recommendations in this area are:

- governments and other interested bodies should develop draft guidelines by which an industry sector might distribute NO_x allocations among its members;
- governments and other interested bodies should investigate the role and need for citizens' access to an appeal of the share allocation process, and also whether alternative mechanisms can offer citizens an effective voice when the distribution of shares becomes controversial for geographic or other reasons; and
- further studies are needed to investigate trading designs, which could provide market players with the necessary confidence to trade and bank coupons, while still retaining the capacity of government to regulate the market in the public interest when necessary.

The Climate Change Group

Despite considerable uncertainty in the scientific community about the long-term effects of increased levels of greenhouse gases, and uncertainty also about the social, economic, and environmental impacts of various possible strategies for reducing these emissions, the need for certain prudent precautionary measures in the next decade is widely accepted. Debate continues, however, about the degree and urgency of action required.

While there is a difference of opinion on the appropriateness of the commitment, the Group used, for the purpose of this exercise, Canada's goal of stabilizing net greenhouse gas emissions at 1990 levels by the year 2000. The need to revisit this goal as new information becomes available is stressed.

The Group recognized the need for a variety of approaches to manage greenhouse gases, ranging from "no-regrets" measures and subsidy removal to regulations and economic instruments. There is also a need to encourage "actions for

credit" that limit net emissions. The Group agreed to focus on broadly based instruments capable of sending price signals through the entire economy — instruments that would encourage both a change in consumer behaviour as well as innovation by both users and producers. Alternative instruments include charges on emissions, and/or tradable permits that impose a fixed cap on emissions within a given area; either could be applied at the level of the producer/importer or consumer/emitter.

A number of gases contribute to the greenhouse effect. Before a charge could be considered, the Group believes the degree of impact of other activities such as "no regrets", voluntary actions, subsidy removal, and ongoing regulation need to be taken into account. At such time as there is a need for an economic instrument, one mechanism that should receive consideration is a hybrid instrument that relates specifically to CO_2 through a charge mechanism and, more broadly, to other greenhouse gases through an offset credit mechanism. The role of CO_2 in climate change is better understood and economic methods for pricing it are more easily implemented than are those for other greenhouse gases. However, in order to promote cost-effective achievement of the environmental goal, other gases can be accommodated through a system of offset credits, within an instrument initially focused on CO_2.

The hybrid instrument proposed by the Group has two components:

i. a charge imposed both on CO_2 emissions from large stationary sources and on the carbon content of fossil fuels used by small stationary and mobile sources; and

ii. an offset mechanism in which deliberate domestic and international measures, resulting in the reduction of greenhouse gas emissions or in increased sequestering of carbon dioxide, can be credited against emission charges for whatever amount of emissions they offset. These credits would be easily transferable.

The Group further recommended that an economic instrument for greenhouse gas management should satisfy the following criteria:

- the price placed on greenhouse gas emissions in Canada should not adversely affect Canada's international competitiveness;
- the instrument should be implemented gradually;
- CO_2 emissions from biomass and the carbon content of feedstock for the production of petrochemical products should be exempted from the charge;
- net government revenue should not increase as a result of the charge;
- the most suitable options for recycling revenue should be researched and selected jointly by government and stakeholders; and administration, monitoring, and enforcement mechanisms should be established with a clear objective to minimize cost and maximize effectiveness.

SETTING THE CONTEXT

Background

As we approach the end of the 20th Century, there is a sea change occurring in the way many people view the environment. Not only are we more aware of the connections among various environmental elements, we are also more aware of the impact of human activities on the environment. It is essential that development to meet present and future human needs be carried out in a manner that is sustainable both environmentally and economically.

Traditional regulatory approaches to environmental protection, often referred to as "command and control," have not always achieved the desired outcome. In the search for more effective and efficient ways to achieve societal goals of environmental protection, the use of market-based approaches offers considerable potential.

In the spirit of searching collaboratively for ways to achieve sustainable development, the Economic Instruments Collaborative (EIC) was formed in 1992. The intention behind the EIC was to focus intensively for a short time on ways to use market forces to better protect the environment. A multi-stakeholder body, the EIC had representation from business, the environmental community, and the National Round Table on the Environment and the Economy. Government representatives were observers throughout the process. While recognizing that market forces could be applied to many environmental issues, the Collaborative focused on the application of economic instruments to air quality issues in Canada. In particular, the EIC directed its attention to acid deposition, ground-level ozone, and climate change.

Members of the Economic Instruments Collaborative

Membership on the Collaborative included:

The National Round Table on the Environment and the Economy

From the Business Community:

- Canadian Petroleum Products Institute (Husky Oil, Imperial Oil, Petro-Canada, Shell Canada)
- Canadian Cement Council
- Dow Chemical Canada
- E.B. Eddy Forest Products
- General Motors of Canada Ltd.
- TransAlta Utilities

From the Environmental Community:

- Energy Probe
- Environmental Resource Centre of Alberta
- Friends of the Earth
- Pembina Institute for Appropriate Development
- Pollution Probe
- Saskatchewan Environmental Society
- Society Promoting Environmental Conservation (SPEC)

The following government departments were represented by observers:

- Government of Canada:
  Environment Canada; Industry, Science and Technology Canada; Finance Canada; Energy, Mines and Resources Canada.
- Government of Alberta:
  Alberta Energy
- Government of British Columbia:
  B.C. Environment

Guiding Principles

The following principles guided the work of the Collaborative, and formed the basis for subsequent discussion around the use of economic instruments to achieve environmental protection.

1. The economy and the environment must be addressed in an integrated manner.
2. Human, financial, technological, and natural resources are limited and must be used effectively and efficiently to meet environmental, social, and economic goals at the same time.
3. Properly designed market-based approaches can:
   a) achieve many environmental goals in a more economically efficient manner than can traditional regulatory approaches;
   b) encourage innovation, reward superior performance, and discourage inefficient practices and therefore, enhance the pace and effectiveness of environmental protection; and
   c) complement, simplify, or in some cases, provide an alternative to traditional regulation.
4. Implementation of market-based approaches must recognize their impact on Canada's competitiveness; by the same token, Canada should not fall behind the performance of its trading partners by failing to take advantage of market instruments for environmental performance.
5. Administrative and regulatory efficiency in the application of both traditional and market-based approaches is essential.
6. Market-based approaches should be developed, tested, and evaluated for success in the achievement of established environmental goals in an economically efficient manner.
7. Assessment, design, implementation, and evaluation of market-based approaches to meeting environmental goals require multi-stakeholder involvement.
8. Strong public support and political will to protect the environment are prerequisites for the successful and cost-effective application of market-based approaches.

Operation of the Collaborative

The EIC formed three working groups to consider the air quality issues of acid deposition, ground-level ozone, and climate change. The groups worked independently in their own areas, reporting to the Collaborative as a whole at four full meetings held during 1992 and 1993. This document represents the culmination of this stage of the work, containing the full reports and recommendations of each working group.

The EIC considered the work done to date on the use of the market to achieve environmental protection, recognizing the diversity of economic instruments that might be used. Among these are tradable permits, user charges, deposit refund schemes, and taxes. The Collaborative was also familiar with experiences of other jurisdictions in using market forces in this way. In the United States for example, there is experience with sulphur dioxide emission trading under the U.S. Clean Air

Act, the phase-out of lead in gasoline, and the Regional Clean Air Program Incentives Market in California. As well, Sweden has used emission charges to improve its air quality.

Within Canada, both Environment Canada and the Canadian Council of Ministers of the Environment have published discussion papers on the use of economic instruments to protect the environment. Industry associations (including the Canadian Association of Petroleum Producers and the Canadian Petroleum Products Institute) have established task forces on economic instruments. Several provinces, including British Columbia, Alberta, and Ontario are examining the application of economic instruments within their jurisdictions.

From the beginning, the EIC was self-directed and self-supporting. The following corporations and agencies provided funding for the work of the Collaborative:

- Canadian Cement Council
- Canadian Petroleum Products Institute
- Dow Chemical Canada
- E.B. Eddy Forest Products
- Environment Canada
- General Motors of Canada Ltd.
- Husky Oil
- Imperial Oil
- National Round Table on the Environment and the Economy
- Petro-Canada
- Shell Canada
- TransAlta Utilities

The meetings of the EIC were aided greatly by the facilitative skills of George Kupfer of Fresh Start Inc. The three reports were prepared by Ann Coxworth of the Saskatchewan Environmental Society (Climate Change); Sheila Malcolmson of Energy Probe (Acid Deposition); and Ellen Schwartzel of Pollution Probe (Ground-level Ozone). Their writing skills and ability to reflect the views of their respective groups were most appreciated by the EIC.

The Economic Instruments Collaborative is hopeful that its work will be a starting point for the effective use of the market to achieve environmental protection in Canada. The following reports represent considerable progress in the direction of integrating the economy and the environment to achieve development that is truly sustainable.

Members of the EIC are committed to the continuing process of educating and communicating about the application of economic instruments with their own and other stakeholder organizations.

THE ECONOMIC INSTRUMENTS COLLABORATIVE REPORT

CONTROLLING ACID DEPOSITION THROUGH EMISSION TRADING

The Acid Deposition Working Group

Gord Lambert, (Chair) Imperial Oil / CPPI

Sheila Malcolmson, Borealis Energy Research Association for the Energy Probe Research Foundation

Mike Kelly, National Round Table on the Environment and the Economy/Clean Air Stategy for Alberta

Mike Pawlicki, Lafarge Cement

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Government Observer:

David Black, Environment Canada

CONTROLLING ACID DEPOSITION

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INTRODUCTION

Emission trading, by establishing a cap on allowable emissions and by abating pollution on a least-cost basis, offers a significant opportunity for meeting society's goals of environmental protection and economic efficiency. In an emission trading regime, those who can control emissions more cheaply than others will sell excess pollution allowances at a profit, while those for whom control is more costly will purchase allowances. Total emissions are constrained, the costs of pollution are internalized, and emission reductions are made on a least-cost basis.

The Acid Deposition Group of the Economic Instruments Collaborative focused its study of economic instruments on emission trading instead of an emission charge for the reasons outlined in the Appendix. Sulphur dioxide (SO_2) was the focus of study because the other main contributor to acid deposition, nitrogen oxides, was addressed in the work of the Collaborative's Ground-level Ozone Group.

The Acid Deposition Group has found that economic instruments have applicability to the acid deposition problem, and that an emission trading system would be best suited to sulphur dioxide control.

The Economic Instruments Collaborative recognizes that further refinement of its proposed emission trading program and resolution of some outstanding public policy issues regarding emission trading will be best achieved through broad public discussion in the context of possible implementation in a specific region. For this reason, the Acid Deposition Group recommends initiation of public discussion regarding implementation of a demonstration project for SO_2 emission trading in Canada. Alberta is particularly well-positioned as an area for a demonstration project, although the emission trading program described here could be implemented in any jurisdiction. The design recommendations outlined in this report should be used as a starting point for such public debate.

Summary of Recommendations

1. Cap Setting and Management

The Acid Deposition Group recognized the existing Canadian sulphur dioxide emissions cap as a framework for emission trading, but did not consider or endorse the specific level of the cap.

The cap should:

1. represent society's environmental goal, and reflect the best available scientific determination of the emission reductions necessary to protect environmental and human health;
2. be set in relation to total actual emissions, not emissions from program participants alone;
3. be regionally targeted, reflecting the need to focus abatement efforts on the regions in which the acid deposition problem is greatest;
4. be set by government, with meaningful input from an advisory cap management body; and
5. not be increased beyond the original determination, once set, except in extraordinary circumstances.

The cap management schedule should:

6. be set on the basis of best available knowledge of ecological and socioeconomic impacts;

7. be legislated by government on the basis of the recommendations from its cap management advisory body;

8. be geographically targeted, for faster and more substantial reductions in the areas where the need is greatest;

9. be assumed to be firm, because certainty surrounding the management schedule is important for investment confidence and environmental benefit.

10. Because ecological impacts and economic effects can never be fully anticipated, four mechanisms to respond to extraordinary circumstances are necessary for the cap management schedule:

    10.1 The government could influence both the annual level of emissions and the availability (and therefore price) of coupons through management of government's share allocation;

    10.2 If, in a given year, ecological circumstances demanded an emission reduction greater than that possible to effect through management of the government's share, the management group could recommend that government purchase, on society's behalf, additional coupons in proportion to the emission reductions required;

    10.3 Environmental and citizens' groups could raise funds in support of achieving emission reductions beyond those regulated by the cap, and could purchase and retire shares and coupons; and

    10.4 The management body should advise government of an identified need to speed or slow the planned reduction schedule, triggering a transparent public process that could lead to revision of the schedule determined in the original legislation. This adjustment mechanism would be used only if more fundamental changes were deemed necessary and these could not be achieved through the first three mechanisms.

Recommendations for further study:

For Recommendations 5, 10.2, and 10.4, the Acid Deposition Group recommends development of criteria, prior to program implementation, for altering the emissions cap and cap management schedule, and for government purchase or confiscation of coupons.

11. The Group recommends additional study of the following employment considerations:

- What will be the impact of the program on one-industry towns, where standards are currently waived due to employment considerations? In an emission trading regime, where such exceptions won't be allowed, does this imply greater site-specific job loss? Even if there is overall job gain from emission trading, could the threat of site-specific losses prevent adoption of emission trading?

- What are the implications for the Canadian coal industry?

- What will be the requirement for job retraining, and what is the best mechanism to ensure provision of retraining costs?

2. Share and Coupon Allocation

12. The trading program should include all sources of SO_2 for which the potential environmental and economic gains of trading outweigh the administrative costs of inclusion in the program.

13. A test should be developed to identify the SO_2 sources for which inclusion in the trading program is economic.

14. A "share" should represent an allotment of the program cap, and entitle the holder to a

defined proportion of the emission coupons to be distributed quarterly.

15. Government should take a small share allocation, enabling it to influence annual coupon prices and emission levels.

16. Government should commit to improved traditional regulatory action to control emissions from non-participants such that the overall environmental goal is met.

17. Sectors of program participants should be allocated shares of the program cap in proportion to emissions over a three-to-five year period, with the count predating announcement of the share allocation.

18. Each sector should determine the formula for division of its allocation.

19. Shares should be distributed by government to existing point sources according to the formula determined by each sector.

20. An appeal mechanism should be in place so that government or the management body can refer appeals of initial share allocation decisions to a specified regulator, preferably one that already exists.

21. A "coupon" should represent a permit to emit one tonne of SO_2. Upon emission of one tonne of SO_2, that coupon is "retired", and is no longer valid.

22. Coupons should be distributed annually to program participants in proportion to their share holdings and in accordance with the schedule predetermined to achieve the established environmental goal.

23. The regulator should attach to each coupon issue an administrative fee sufficient to cover regulatory and reporting costs.

Recommendations for further study:

24. The Group recommends further examination of property rights and other legal and jurisdictional implications of share and coupon issue.

3. Share and Coupon Trading

25. Shares, with the exception of those held by government, should be transferable — that is, they can be sold.

26. A coupon should be transferable (it can be sold), and it should be valid until used (it can be "banked" for later use or sale).

27. Sales of shares and coupons should be registered with a central regulator after the trade has been made.

28. Further study should be done of existing and necessary mechanisms for stakeholder input into the siting and specifications of facility construction and expansion.

29. Anyone should be able to buy coupons from the market; anyone but government should be able to buy shares.

30. New facilities that will emit SO_2 should have to acquire shares and/or coupons as necessary to meet their operating requirements.

31. "Banking" should be allowed. This would enable a company to save unused coupons from one period, carry them over, and apply them to emissions in a later period.

32. Banked coupons must not be confiscated or devalued.

33. A futures market for coupons may accelerate trading and should not affect the environmental goal. However, introduction of this service for investors will result from the desires and requirements of program participants, and therefore government does not have to design this into the trading program.

34. Any emission source should be able to close down and sell its shares and/or coupons.

35. Emission trading should be restricted to Canada for the time being. International trading should be examined once all aspects of the Canadian program are working smoothly.

36. Emission trading should be restricted to trades involving shared airsheds.

37. If interpollutant trading addresses the environmental problem, it should be considered, but not until SO_2 trading is working well.

38. Competition is crucial to the smooth operation of the trading market and manipulation should not be tolerated. However, the expectation of the Acid Deposition Group is that existing legislation will address abuses, and therefore specific design responses to the possibility of anti-competitive actions should not be undertaken at this time.

Recommendations for further study:

39. The federal Department of the Environment should solicit specific proposals to answer questions about operation of the market, behaviour in the market, and market liquidity, focusing on the adequacy of existing tools.

4. Performance Requirements

40. Every tonne of SO_2 emitted must be accompanied by retirement of a SO_2 emission coupon.

41. All program participants will have facility-specific operating terms and conditions specified in their Licence to Operate (or their Permit, depending on the jurisdiction), developed through discussions with government and local stakeholders. This will include a defined maximum hourly emission rate limit, based on health and environmental criteria.

42. The maximum hourly rate should be derived by dispersion modelling methods approved by the Minister of the Environment to ensure that applicable maximum hourly ground level concentration and ambient air quality objectives are not exceeded. The modelling work should take into account other area sources so that the cumulative impact of all facilities in an area is considered.

43. Models can be used as a tool to assist in predicting the behaviour of multiple sources, but these are models and, as such, cannot be relied upon completely to guarantee actual outcomes. The following mechanisms should be used if, despite compliance with the cap and the maximum hourly emission rates, unanticipated local ambient problems arise:

    43.1 The Minister could intercede when licensed performance limits (e.g., maximum hourly emission rates) specified in a Licence to Operate are causing unanticipated environmental and/or human health concerns;

    43.2 Operators in a given area could cooperatively develop a course of action to address an ambient air quality problem by adjusting their operating practices or developing and implementing a cooperative response strategy;

    43.3 Enforcement provisions in most jurisdictions in Canada would allow the government to issue a stop order or control order that either shuts down a facility if it is causing immediate risk, or specifies corrective action to be taken in a specified time frame; and

    43.4 The public should have the ability to initiate an investigation if there is concern regarding a specific facility or regional environmental conditions.

44. Under all circumstances, a facility must comply with its licensed operating terms and conditions, including its maximum hourly rate, regardless of its coupon or share holdings.

45. Other performance specifications as deemed necessary by the Minister of the Environment, for example stack design parameters for new

facilities, should continue to apply according to the Terms and Conditions of the Licence to Operate. Conditions no longer applicable should include percent sulphur recovery limits and daily or annual maximum emission rates.

5. Monitoring and Reporting

46. Program participants should measure the concentration of SO_2 in the flue gas and the volume of flue gas emitted to determine total tonnes of SO_2 emitted at a given source over time.

47. The method of measurement should be specified by the regulator according to the Air Quality Monitoring Directive issued by the Minister of the Environment.

48. Stack surveys should be conducted at a frequency specified in the Licence to Operate and will be conducted according to Ministry of Environment requirements, and should be subject to on-site observation and investigation by Ministry inspectors. Violation of the maximum hourly rate and ambient standard would trigger an investigation and appropriate enforcement response. Audits would also be conducted occasionally and randomly, independent of complaints or violation of ambient standards.

49. All monitoring data, including calibration data for measurement equipment, should be retained by program participants for at least five calendar years.

50. The Minister of the Environment should request production data from the proponent or any other government agency for the purpose of verifying reported emissions.

51. The Minister should audit current and past data, as necessary and with no prior notice, to ensure compliance with program requirements. Failure to provide data or falsification of data should be considered a punishable offense.

52. Coupon/share holders should report the tonnes emitted and the status of their coupon and share holdings quarterly using a specified form.

53. Any change in ownership of shares or coupons should be registered with the appropriate government or administrative agency, depending on the province, within two business days following conclusion of a transaction. The information provided on the transaction should include the number of shares or coupons transferred and the price at which the transaction occurred. The commercial terms of any specific arrangement should be kept confidential.

54. The government should reserve the right to make general price information available for program participants as necessary to assist in the functioning of an effective market.

55. Neither brokers nor commodity exchanges should be precluded from involvement in the market.

56. Further study should be conducted to determine what monitoring equipment is currently in place, what is available and appropriate, and what monitoring upgrades would be necessary in a trading program.

57. Improvements in ambient air quality monitoring should be included in the scope of work required to ensure that an emission trading program will achieve society's desired environmental objectives.

6. Enforcement

58. If a facility has emitted more tonnes than its coupon holdings allow at the end of any calendar quarter, the facility should have 30 calendar days following the end of the quarter to acquire coupons equivalent to the amount of the imbalance, such that its actual emissions are at least equal to its coupon holdings.

59. If an imbalance remains following this 30 day period, a fine of $2500/tonne and a requirement to retire coupons at a ratio of two coupons for each tonne in exceedence should be imposed and an Enforcement Order issued, which could lead to prosecution. Fines should be used in a manner to be determined by the relevant jurisdiction, but the Acid Deposition Group recommends that revenue from fines not be directed to general revenues.

60. The Enforcement Order should include any other provisions as specified under legislation (such as a control order or stop order).

7. Next Steps

61. Public discussions regarding implementation of a demonstration project for SO_2 emission trading in Canada should be initiated.

62. This report should be used as a basis for national discussion on how emission trading might be used to address the acid deposition problem.

GLOSSARY

Throughout this report the following terms apply:

Cap: A ceiling or finite regulatory limit established in law to hold emissions to a level sufficient to protect environmental health. The cap represents the scientifically determined societal goal for environmental protection. That determination may or may not require reductions from existing emission levels.

Environment: The natural world, including its human inhabitants.

Annual Emission Limit: The scheduled annual emission levels required to achieve the cap goal over time.

Acid Deposition Management Plan : The regionally defined plan for managing emissions associated with acid deposition. It states the goal and the basis for the goal and a schedule for amounts emitted over time, called "annual emission limit" above.

Share: An allotment of the program cap, entitling holders to a defined proportion of the emission coupons distributed quarterly. Shares, with the exception of those held by government, are transferable; that is, they can be sold.

Coupon: A permit to emit one tonne of SO_2. Upon emission of one tonne, that coupon is "retired", and no longer holds value. A coupon is transferable, that is, it can be sold; and it is valid until used, that is, it can be "banked" for later use or sale.

Government: As referred to here could represent either federal or provincial Ministries of the Environment. "Government" for the purposes of this discussion is not considered by the Acid Deposition Group to be an emitter of SO_2. Government in its incarnation as a polluter — a Crown-owned electric utility, for example — would be treated as any other emitter and would have to purchase pollution shares and coupons from the market.

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- the individuals who enthusiastically participated in or observed the process of the Acid Deposition Group, and the companies, agencies, organizations, and government departments that made it possible for them to do so;
- Gord Lambert, who chaired the Group; and
- Sheila Malcolmson, who wrote this report.

CHAPTER 1
CAP SETTING AND MANAGEMENT

1.1 Benefits

Cap setting provides certainty as to the quantity of SO_2 emitted: geographically defined annual limits on SO_2 emissions will be established, in the form of tonnes per annum in a given airshed.

For the environment, there are obvious benefits to having a finite limit on emissions. The existing technology-based regulatory regime is playing catch-up: because regulators can now only influence total amounts emitted by focusing on individual point sources, they regulate largely on the basis of available technology or "available technology economically achievable", rather than on the basis of the most desirable environmental outcome. Taking an effective "command and control" approach to historical facilities has proven to be politically unfeasible, and if the regulatory focus remains on new entrants alone, total emissions are bound to increase.

Cap setting eliminates differences in regulatory treatment between old and new emitters, and diminishes greatly the incentive to lobby for a political outcome.

Limiting the supply of permits to emit, as cap creation does, and making those permits transferable, as emission trading does, creates greater investment confidence, guaranteeing the continued value of industry's emission abatement expenditures.

Regulators now try to minimize emission increases through application of "new source performance standards" and occasionally revised standards for existing plants. Often new facilities bear a disproportionate share of the emission reduction cost, even where comparable expenditures spent other ways — such as reducing emissions at older, dirtier facilities — could result in greater environmental savings. Maintaining the status quo will result in continued expenditures on emission reduction, independent of the cost-effectiveness of the actions being requested or the incremental environmental benefits to be derived.

1.2 Existing Legislation

As a federal government initiative under the Green Plan, a sulphur dioxide emission cap of 3.2 million tonnes per year by the year 2000 was established as a target for Canada in the U.S./Canada Acid Rain Accord of 1991. Of that cap, 2.3 million tonnes have been assigned as an Eastern Canadian cap, to be in effect by 1994. This represents a 40 percent reduction from 1980 emission levels. The remaining 900,000 tonnes per year have not yet been allocated among the provinces west of Ontario. No detailed plan exists that describes how Canada will manage its emissions of SO_2 over time to ensure compliance with the negotiated cap. The cap is likely to be revisited by Environment Canada, on environmental grounds: New Brunswick, for example, will continue to have unacceptably high loadings under the existing cap.

The cap that forms the basis of the U.S. emission trading program limits total sulphur dioxide emissions by all electric utilities to 8.9 million tons per year by the year 2000, ten million tons less than in 1985.

The Acid Deposition Group recognized the existing Canadian sulphur dioxide emissions cap as a framework for emission trading, but did not consider or endorse the specific level of the cap.

1.3 Cap Design Recommendations

RECOMMENDATION 1: *The cap should represent society's environmental goal, and should reflect the best available scientific determination of the emission reductions necessary to protect environmental and human health.*

"Critical loading", defined as the highest load that will not cause long-term damage to the most sensitive ecosystems, is a lower deposition level than is "target loading", the measurement now used in standard setting.[1] Critical loading represents some of the science available for determining the level of the cap. Socioeconomic considerations should be reflected in the management plan for achievement of that goal, described in section 1.4.

If this recommendation is not adopted, then the cap should be set in relation to actual emission levels, not legislated or "allowable" emissions. In Alberta, for example, 539,000 tonnes of SO_2 were emitted in 1985, but permits allowed for more than one million tonnes of emissions. Capping at legislated levels could lead to net environmental detriment.

RECOMMENDATION 2: *The cap should be set in relation to total actual emissions, not emissions from program participants alone, if some sources of SO_2 are excluded from the trading program.*

RECOMMENDATION 3: *The cap should be regionally targeted, reflecting the need to focus abatement efforts on the regions in which the acid deposition problem is greatest.*

A way of visualizing this concept is to imagine that there is a bubble placed over a geographic area of concern. An example might be a situation in Canada where, from an environmental perspective, two trading zones were established, one being Eastern Canada (Ontario and provinces to the east), and one a Western Canada trading zone (Alberta, Saskatchewan, Manitoba). In other words, two large regional bubbles were put in place. There would then be specific local, geographic areas within each of those trading zones that are uniquely sensitive, where local emitters are contributing to an environmental risk. In such a situation, emission trading could accommodate establishment of a unique cap by establishing a local bubble within a larger regional trading zone or bubble.

It should be noted, however, that each time a smaller geographic area is targeted for special treatment, economic efficiency benefits are compromised because of trading restrictions imposed on emitters within the smaller areas. This can be partially remedied by allowing emitters within a restricted local trading region to sell unused coupons or shares to emitters outside the area. However, they would be prohibited from buying coupons or shares from anyone outside the area. This provides some financial incentive to improve performance but in a manner that does not compromise the local cap. This trading

[1] Canadian Council of Ministers of the Environment in 1983 established 20kg of wet SO_4 per hectare per annum as the "target loading" goal to protect moderately sensitive aquatic systems in Eastern Canada. This determination is based on technical feasibility and economic costs as well as environmental damage. The 1991 *State of Canada's Environment* notes a Long-Range Transport of Air Pollutants Program (1990) determination of a 8-12 kg/ha/a target value that is required to protect more biologically sensitive water.

In western Canada, concentrations of sulphate in precipitation are not a good surrogate for acidic deposition because of the contribution from windblown dust, and because dry deposition generally exceeds wet deposition. The dust contribution is addressed by calculating Acidifying Potential (AP) in wet deposition, which led the Interim Acid Deposition Task Force (1990) to propose a critical loading of 0.12-0.31 keq/ha/a for western and northern Canada. The dry deposition component, as well as the contribution from oxides of nitrogen, is addressed in the definition of Effective Acidity (EA) as the sum (wet and dry) of direct mineral acidity and the net (production minus consumption) acidity after receptor processing of total deposition. Alberta suggested EA targets of 0.1 to 0.3 keq/ha/a (*A Review of Approaches for Setting Acid Deposition Limits in Alberta.* Alberta Environment, 1990). Relating wet sulphate targets and EA targets requires simplifying assumptions. If all acidity occurs as sulphuric acid, then 20 kg/ha/a wet sulphate is equivalent to an EA of 0.42 keq/ha/a. Similarly 8-12 kg/ha/a wet sulphate is equivalent to an EA of 0.17 to 0.25 keq/ha/a.

mechanism is described further in Chapter 3, Share and Coupon Trading.

RECOMMENDATION 4: *The cap should be set by government, with meaningful input from an advisory cap management body.*

The establishment of the cap should involve broad consultation. This does not imply any abrogation of government's authority or responsibility, but does give government the opportunity to hear the views of stakeholders and to reflect them in the final product. This is proactive rather than reactive, and opens the decision-making process to the public.

RECOMMENDATION 5: *The cap should not be increased beyond the original determination, once set, except in extraordinary circumstances.*

Businesses will have made pollution control investments in good faith and with the expectation that their value could only stay constant or appreciate. Raising the cap, the equivalent of printing "environmental currency", would cause coupon inflation. The certainty of the cap is crucial to investment confidence and smooth operation of the market. Keeping the cap firm also precludes revisiting the "jobs or environment" debate. Were socioeconomic considerations to warrant a reconsideration of the original environmental goal and cap management schedule, it should be the schedule that is altered, as described in section 1.4. Changing the level of the cap because of economic dislocation might work too slowly to be of much help anyway (NERA 1990).

However, in extraordinary circumstances, revisitation of the level of the cap could become necessary. New scientific information about the ecological impacts of acid deposition would warrant a public reconsideration of the emission reduction goal. Criteria for launching a cap review must be developed in advance of implementation of the trading program: some threshold of change in the information base and some test of scientific support for new information should be developed. An independent body could be established for the review of new scientific literature, and it would notify the public and the cap management advisory body in the event of a requirement for review of the cap. Such a mechanism might be preferable to a regular review (every five years, for instance), in that the review would be conducted only as necessary.

This said, nothing in the proposed emission trading program abrogates the sovereign right of government to change or cancel the legislation at any time. Nor should government be absolved of its responsibility to manage and protect air quality.

1.4 Cap Management Plan

Having established the environmental goal, the next task is to determine the rate at which it will be achieved. If the cap is a "stabilizing" one, the task is easy. If a reduction in emissions is required, the following cap management principles should be applied:

RECOMMENDATION 6: *The cap management schedule should be set on the basis of best available knowledge of ecological and socioeconomic impacts.*

A reduction of 100,000 tonnes from existing emission levels, for example, could be achieved in two 50,000-tonne cuts over six years, or four 25,000-tonne cuts over twelve years. The schedule should specify the outside date for achievement of the environmental goal.

RECOMMENDATION 7: *Government should legislate the cap management schedule on the basis of the recommendations from its cap management advisory body.*

The cap management advisory group's first function would be to advise government on the level of the cap and the cap management schedule. It might refer appeals of share allocation decisions to the designated regulator (as recommended in section 2.2), and might identify to government the

need for revisitation of the cap management schedule. Emitters would be represented in the process.

Membership in the cap management advisory group would consist of "society's shareholders": environmental groups; consumer groups; government ministries representing development, economics, environment, and public health; chambers of commerce or some other group representing industry as a whole; labour representatives; and associations representing emitters.

The second function of the advisory group would be to advise government on management of the government share allocation (see section 2.2, recommendation 15). Emitters would be excluded from voting on issues related to this second function. The membership principle should be that the group represents society's interests very broadly, and does not have specific self-interest. Industry would manage its own shares to influence the market, and the management body and government would manage the government allocation.

RECOMMENDATION 8: *The cap management schedule should be geographically targeted, for faster and more substantial reductions in the areas where the need is greatest.*

RECOMMENDATION 9: *The management schedule adopted in legislation should be assumed to be firm, because certainty surrounding the cap management schedule is important for investment confidence and environmental benefit.*

RECOMMENDATION 10: *Because ecological impacts and economic effects can never be fully anticipated, four mechanisms to respond to extraordinary circumstances are necessary for the cap management schedule:*

10.1 *The government could influence both the annual level of emissions and the availability (and therefore price) of coupons through management of government's share allocation.*

Government would receive a small percentage of the total share allocation for the purposes of management flexibility, as described in section 2.2, and would be allocated coupons in proportion to its share holdings, as described in section 2.4. The appointed multi-stakeholder advisory group would counsel the government on its coupon allocation in a given year, in a transparent decision-making process.

Were new entrants experiencing difficulty gaining access to coupons, the management group might advise that government's coupon allocation be sold to the market that year. If the reduction transition were more difficult than anticipated by the legislated reduction schedule, the management body might advise government to sell its allocation for that year, lowering coupon price and thereby slowing the abatement investment schedule. Government could sell only to the central marketplace: coupons could not be granted selectively. Revenue generated from government's coupon sale would be used in a manner determined by each jurisdiction.

Were environmental circumstances to arise that warranted emission reductions beyond those scheduled, the management group might advise that government's allocation be retired. Alternatively, government could "bank" its coupons, as described in section 3.2, guaranteeing fewer emissions for that year, but keeping open the possibility of coupon release to the market in later years, if environmental circumstances permitted or market conditions warranted.

10.2 *If, in a given year, ecological circumstances demanded an emission reduction greater than that possible to effect through management of the government's share, the management group could recommend that government purchase, on society's behalf, additional coupons in proportion to the emission reductions required.*[2]

[2] In addition to this provision, government would retain the right to issue a control or stop order on a facility or facilities in the event of local environmental damage or ambient exceedences, as described in sections 4.3, 6.2, and 6.3.

Government would be prohibited from purchasing shares from the market because otherwise it could become too powerful in the program. Government could not compel any coupon holder to sell to it.[3] Regardless of the chosen mechanism, criteria for government purchase or confiscation must be developed prior to program implementation.

10.3 *Environmental and citizens' groups could raise funds in support of achieving emission reductions beyond those regulated by the cap, and could purchase and retire shares and coupons.*

Any individual or organization could do the same.[4]

10.4 *The management body should advise government of an identified need to speed or slow the planned reduction schedule, triggering a transparent public process that could lead to revision of the schedule determined in the original legislation. This adjustment mechanism would be used only if more fundamental changes were deemed necessary and these could not be achieved through the first three mechanisms.*

Criteria for entering into this revision process must be developed in advance of program implementation. Written into the original legislation should be a stipulation that the environmental goal must be achieved by a particular year. A requirement for notice of an adjustment to a legislated schedule should be in place; four year's prior notice, for example, might be required for deviation from the original schedule. It must be recognized that changes to the established schedule may be resisted by some industry stakeholders, as well as by environmental representatives.

1.5 Outstanding Issues Relating to Cap Setting and Management

The only outstanding issue in the area of cap setting and management is the potential for job loss. Although the trading program's cost-effectiveness and compliance flexibility should benefit labour, some employment issues arising from the cap-setting process demand further study.

To the extent that emission trading increases the capital efficiency of environmental protection, additional societal resources are available for development, jobs, and achievement of other societal goals. Compared with existing standards-based environmental control strategies, trading offers emitters response flexibility: in a trading system, a firm that is unable to meet new caps can purchase coupons from the firms that can, thus providing another (and lower cost) alternative to plant closure. It is estimated that had the United States relied on command and control regulation rather than emission trading to meet its SO_2 emission reductions, 145,000 person years of manufacturing employment would have been lost by 2005 (Dudek and LeBlanc 1992).

An argument for earlier rather than later introduction of emission trading is that a long adjustment period can attenuate social disruption. Waiting until there is a big pollution problem and a tight lead time to implement trading could aggravate unemployment.

RECOMMENDATION 11: *The Acid Deposition Group recommends additional study of the following employment considerations:*

[3] An alternative recommendation is that government have the power of coupon confiscation, rather than purchase, described further at the end of section 3.2.

[4] In March 1993, the Cleveland-based nonprofit environmental group National Healthy Air License Exchange submitted bids for 1,100 SO_2 pollution permits, each permit allowing emission of one ton of SO_2. "Historically, environmental groups have been able only to litigate or lobby," the group's president said. "But now we can actually buy pollution rights and let them expire unused, thereby keeping tons of pollution from being released into the atmosphere. We've gotten contributions to do this from people who never thought about getting involved in environmental causes before." The group actually bought one permit for $350 and plans to retire it. Also, Northeast Utilities of Hartford, Connecticut, announced it would donate 10,000 of its 140,000 annual allowances to the American Lung Association, which plans to retire them (Taylor 1993a; Taylor 1993b).

- What will be the impact of the program on one-industry towns, where standards are currently waived due to employment considerations? In an emission trading regime, where such exceptions would not be allowed, does this imply greater site-specific job loss? Even if there is overall job gain from emission trading, could the threat of site-specific losses prevent adoption of emission trading?
- What are the implications for the Canadian coal industry?
- What will be the requirement for job retraining, and what is the best mechanism to ensure provision of retraining costs?

CHAPTER 2
SHARE AND COUPON ALLOCATION

2.1 Determination of Program Participants

RECOMMENDATION 12: *The trading program should include all sources of SO_2 for which the potential environmental and economic gains of trading outweigh the administrative costs of inclusion in the program.*

This is a departure from the U.S. program in which only large electricity-generating stations were included, although there is provision in the U.S. for industrial sources to "opt in." The expectation of the Acid Deposition Group is that all sources except the transportation sector would be included in Canada's trading program, but further study is required. Emissions from such sectors, although excluded from the trading program and therefore the share allocation, would be represented in the established environmental goal.

RECOMMENDATION 13: *A test should be developed to identify the SO_2 sources for which inclusion in the trading program is economically desirable.*

2.2 Allocation of Shares

RECOMMENDATION 14: *A "share" should represent an allotment of the program cap, and should entitle the holder to a defined proportion of the emission coupons to be distributed quarterly. One "coupon" is required to emit one tonne of SO_2.*

RECOMMENDATION 15: *Government should take a small share allocation, enabling it to influence annual coupon prices and emission levels.*[5]

It is of environmental benefit to have a mechanism for government intervention in the market, on the advice of citizens' groups. It is in emitters' interests to allow government intervention for the purpose of market liquidity.[6]

"Government" for the purposes of this discussion is not considered by the Acid Deposition Group to be an emitter of SO_2. Government in the role of an emitter — a Crown-owned electric utility, for example — would be treated as any other participant and would have to purchase pollution shares and coupons from the market. Government would not have the right to grant its coupon allocation selectively: it would have to sell to the open marketplace.

RECOMMENDATION 16: *Government should commit to improved traditional regulatory action to control emissions from non-participants, such that the overall environmental goal is met.*

Later entry to the trading program by non-participant sectors should be permitted, as long as existing participants' share allocations are not affected, and the cap not exceeded.

RECOMMENDATION 17: *Sectors of program participants should be allocated shares of the program cap in proportion to emissions over a three-to five-year period,*[7] *with the count predating announcement of the share allocation.*

[5] The U.S. government holding was three percent.

[6] See section 1.4 for more details on how this would work.

[7] This number requires more precise calculation.

Figure 1 illustrates how this allocation might work.

RECOMMENDATION 18: *Each sector should determine the formula for division of its allocation.*

If participants could not agree on a formula for deciding the allocation within a predetermined time, government, perhaps through the management body (described in section 1.4), would decide, but it is expected that participants would prefer to decide themselves.

Stakeholders might choose from among a range of distribution formulas, such as historical emissions, emissions per unit of production, historical fuel use multiplied by emission rate/Btu, or some criterion of current good practice such as "best available technology" or "new source performance standards."

The petroleum industry, for example, might distribute its share allocation among its own sectors (sour gas, tar sands, refineries), and each of these sectors might choose a different allocation formula. The sour gas industry, for instance, might allocate on the basis of a sulphur input formula; that is, sulphur inlet volume relative to total industry inlet volumes. This way, if identical facilities receive an equal allocation, but one has more advanced sulphur recovery, it is rewarded for current performance. This formula helps create equity between plants of different sizes.

Competitors within sectors will need to be alerted to some potential problems at the point of share allocation:

- Polluters could, in anticipation of the share allocation, boost their SO_2 emissions to increase their historical average and therefore the size of their allocation, to profit from coupon sales. This could be prevented by counting several years backward from the date of announcement of the trading system, or by choosing a different allocation mechanism.
- In some sectors, emitters at extreme ends of the spectrum might not be dealt with fairly by an historical-average allocation: the cleanest companies, having made pollution control investments ahead of their time, would, in effect, be penalized by being under-allocated compared with their competitors. The dirtiest companies would receive a very large allocation and could profit by making the same retrofits made by their clean and unrewarded competitors years earlier. For this reason, an allocation based on a standard might be preferable: those few that do not meet the standard would be assigned coupons only on the basis of that allowable emission limit. This could prevent the inadvertent rewarding of companies that were slow to adopt pollution control technologies.

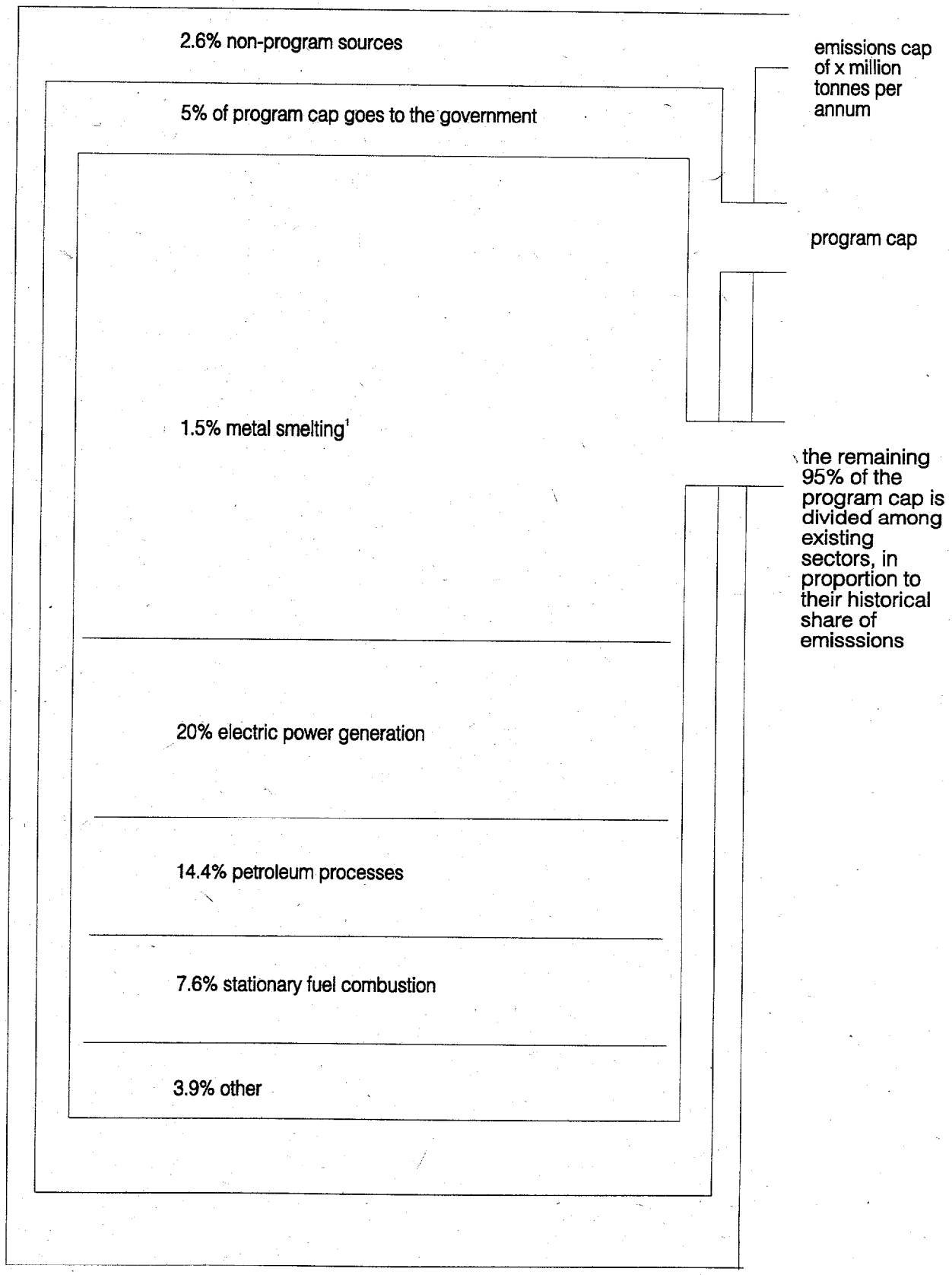
This fear of condoning outmoded and polluting point sources through share allocation — in effect, *grandfathering with a potential property right* — is often cited as a very basic problem with trading. If allocation is done in the political arena, this effect is likely to result. This underscores the importance of conducting intra-sector allocations on an industry stakeholder basis: with competitive pressures, industry will regulate other firms far better than any government could, if there are only so many shares to go around.

- Facilities facing retirement with or without a trading program would be motivated to acquire a share allocation anyway, for it could be sold once the facility is closed. This phenomenon is described further in section 3.4, and its possibility should be policed by competitors at the time of initial share allocation; firms have a vested interest in ensuring that their competitors don't profit unfairly from a closure.

RECOMMENDATION 19: *Shares should be distributed by government to existing point sources according to the formula determined by each sector.*

RECOMMENDATION 20: *An appeal mechanism should be in place so that government or the management body can refer appeals of initial share allocation decisions to a specified regulator, preferably one that already exists.*

Figure 1. SO_2 Emission Trading Share Allocation



[1]These sectoral percentages are illustrative only

Citizens should have access to this process, and a statute of limitations on appeals would be needed.

2.3 Alternative Share Distribution Mechanisms

The Acid Deposition Group's preferred form of share distribution, described above, is recommended on the basis of its equity, and because it seems the least disruptive and most predictable allocation mechanism: all players will be pretty much the same after the allocation as before it. It offers a greater degree of certainty and security than do other allocation schemes, and provides an opportunity to design a system that is more fair than simply selling to the highest bidder, as an auction allocation would do.

However, an auction of shares is an alternative to distribution by formula; it has the benefit of ease, and it provides compensation to society for the rent of its resource. It may also make entry to the SO_2 pollution market easier for newcomers in the year in which the initial share allocation is made.

Still, there are problems associated with a share auction:

- reduction of capital available to point sources to decrease emissions (although there is no way to be sure that the money would otherwise be directed to environmental protection); money collected by government produces no environmental benefit unless it is so targeted.
- potential for more social disruption due to plant closures or layoffs. Closure or layoffs may result if a plant faces financial pressure because it must now pay to emit, where before, that privilege had been free of cost; or if the source does not get the necessary emissions allocation.
- less certainty for existing emitters as to the availability of pollution permits.
- additional costs to existing emitters. Since emitters have already incurred costs to meet existing regulations, the auction represents an additional cost to that which they have already borne to obtain the right to emit. Some participants would not be able to recover such incremental costs in the near term due to the commodity nature of their business.

There is a caveat, however. If there is a scheduled cap reduction, share distribution is preferable to a share auction. If there is no cap reduction, shares should be auctioned. Otherwise, society would be better off with an emissions charge system, insofar as valuation of atmospheric resources is concerned.

2.4 Allocation of Coupons

RECOMMENDATION 21: *A "coupon" should represent a permit to emit one tonne of SO_2. Upon emission of one tonne of SO_2, that coupon is "retired", and is no longer valid.*

RECOMMENDATION 22: *Coupons should be distributed annually to program participants in proportion to their share holdings and in accordance with the schedule predetermined to achieve the established environmental goal.*

For example, if a cap reduction schedule were in place, participants would know that in the first year of the program, one share entitles a holder to one coupon; but in the fifth year, it would entitle a holder to 0.85 coupon; and in the tenth year, 0.75 coupon. Regulators would effect such a change in coupon value by altering the share dividend rate in accordance with the established emission reduction schedule.

RECOMMENDATION 23: *The regulator should attach to each coupon issue an administrative fee sufficient to cover regulatory and reporting costs.*

The fee would vary from year to year.

2.5 Outstanding Issues Relating to Share and Coupon Allocation

Issues surrounding property rights remain outstanding. Neither shares nor coupons should represent any more of a legal right to emit than point sources presently hold. A recent U.S. court decision stated that a coupon was not a property right. Canadian legal opinions are needed, but were not within the purview of this study.

Property rights, where they do exist, inevitably carry constraints deemed necessary for societal and environmental protection. Through the design of this trading program, the Acid Deposition Group has developed many rules constraining emitters' actions to ensure environmental protection; these are outlined in Chapter 4. Such rules would override any other action in a trading program, with or without "property rights." Thus the outcome of legal studies on property rights, as long as strong environmental performance requirements and monitoring and enforcement rules are in place, may be irrelevant for the purposes of this exercise.

Industry might favour property rights to protect its investments in pollution control, emission shares, and coupons from unfair confiscation by government. Such protection can be assured by other means.

RECOMMENDATION 24: *The Acid Deposition Group recommends further examination of property rights and other legal and jurisdictional implications of share and coupon issue.*

CHAPTER 3
SHARE AND COUPON TRADING

RECOMMENDATION 25: *Shares, with the exception of those held by government, should be transferable; that is, they can be sold.*

RECOMMENDATION 26: *A coupon should be transferable (it can be sold), and it should be valid until used (it can be "banked" for later use or sale).*

A point source could use its allocated coupons to offset emissions, reducing emissions in step with a legislated reduction schedule if necessary. Alternatively, emissions could be reduced in advance of the legislated schedule, or in volumes greater than those required, thus freeing coupons for sale to other point sources. Purchase of coupons would be attractive to an individual point source or firm if the coupon price were less than the cost of the upcoming requirement for emission reduction.

Where there are no reductions in the cap management schedule, program participants will still trade coupons among themselves, such that abatement investments are focused on the emission sources for which controls are least expensive. This effect in stable emission scenarios will be accelerated by the entry of newcomers to the pollution market.

Coupon sale and purchase ensures that abatement investments are made on a least-cost basis, while meeting the overall environmental goal. In a scenario requiring remedial action and, therefore, scheduled cap reductions, there will be many trades. In stable emission situations, the trading volume will be smaller and related mostly to marginal differences in operating costs, resulting in more efficient use of existing facilities. Either way, as long as the cap is not exceeded, the environmental goal will have been reached, which is the objective of this program. Even a small number of trades will involve significant dollar values and potential economic efficiency gains.

RECOMMENDATION 27: *Sales of shares and coupons should be registered with a central regulator after the trade has been made.*

Trades involving banked coupons might require pre-approval if the Acid Deposition Group's recommendations on performance requirements (described in Chapter 4) are not adopted.

If modification of existing facilities and construction of new point sources require environmental impact assessment and regulatory pre-approval (as is the case in Alberta, and may become the case for all provinces under the new Canadian Environmental Assessment Act), such activities are already subject to stakeholder input. Pre-approval of share purchase as a means to influence the siting and specifications of facility construction or expansion would, in these cases, be unnecessary.

RECOMMENDATION 28: *Further study should be done of existing and necessary mechanisms for stakeholder input into the siting and specifications of facility construction and expansion.*

RECOMMENDATION 29: *Anyone should be able to buy coupons from the market; anyone but government should be able to buy shares.*

This has benefits in the following areas:

- government and environmental groups would have management flexibility;

- stockbrokers and commodity exchanges could offer futures markets and facilitate sales; and
- pollution abatement companies could accelerate the pace of both technology innovation and emission reductions. For example:

Some pollution-abatement equipment suppliers are manoeuvring now to take advantage of the market trading schemes. Pure Air, a joint venture of Mitsubishi and Air Products and Chemicals, proposes to install sulphur dioxide reduction equipment at a customer's site. Pure Air would own and operate the installation and guarantee to meet reduction targets. It will sell excess allowances for its own profit, or purchase additional allowances at a loss to itself to bring its customers into compliance. Noxso, a Pittsburgh-based firm, proposes to do much the same, but will offer reductions in nitrous oxide in addition to sulphur dioxide using a chemical sorbent system (Reisch 1992).

3.1 New Entrants to the Market

RECOMMENDATION 30: *New facilities that will emit SO_2 should have to acquire shares and/or coupons as necessary to meet their operating requirements. Whereas existing emitters had a reasonable expectation that they wouldn't have to pay for the use of the resource, new entrants would have to pay for the privilege of emitting.*

Most historic participants should be able to reduce their emissions well below their allowance levels, thereby creating more "headroom" for the construction of new facilities. Plant retirements and decreasing use of existing point sources over time would also liberate emission allowances for use by new entrants.[8]

3.2 Banking

RECOMMENDATION 31: *"Banking" should be allowed. This would enable a company to save unused coupons from one period, carry them over, and apply them to emissions in a later period.*

Banked coupons might be held informally by firms planning to use them later in the reduction schedule or in a facility expansion. Banked coupons offered for sale might be formally registered on commodity exchanges and with regulators; any broker should know where to find banked coupons.

Banking has the following benefits:

- prevention of instability in the price of coupons, which would otherwise occur near the end of a trading period as coupon holders attempt to unload excess coupons before they expire. Such price instability could lead to higher emission levels at the end of each quarter.
- accommodation of pronounced business cycles, and provision of flexibility in meeting emission reduction targets or in phasing out polluting substances;
- acceleration of emission-abatement measures. Where the program calls for a reduction in the cap, banking can provide an incentive to a firm to invest in pollution control earlier rather than later, and thus accumulate surplus coupons to sell later at what is likely to be a higher price. Banking thereby encourages over-control.

Allowing banking in the U.S. lead-in-gasoline trading program forced reductions earlier than would otherwise have been the case: because a lead permit was less valuable prior to the scheduled reduction than it would become after the more stringent standard of 0.1 gram-per-gallon came into effect, lead emitters made emission reductions earlier than required and banked their unspent allowances for later use or sale. Banking allowed refiners to smooth implementation of the standard. It saved US$225 million, or 20 percent of

[8] See Elman 1990, for more information.

the cost to refiners of the phase-down rule (NERA 1991).

Without provision for banking, emitters might feel they were wasting their coupon allocation if they didn't emit to their full limit, and would thereby have extra incentive to emit.

- reduction of trading transaction costs by helping to identify surpluses for sale. The "bank" would be the place where prospective purchasers would start to look for allowances. Banked surpluses should be more available than informally-held surpluses.
- facilitation of emission reductions in cases where, for environmental reasons, trading zones are small and the number of point sources few. Without the ability to bank, emitters would not reduce emissions beyond the legal requirement if a coupon or share buyer could not be found immediately.
- reduction of the supply of coupons by banking would increase coupon price, thus increasing the incentive to reduce emissions.

An argument against banking is that, although there is environmental benefit for the banked period, ecological damage could result from a sustained release of banked coupons. The same would be true for nitrogen oxides, but not greenhouse gases.[9]

The additional environmental controls envisaged by a maximum hourly emission rate for each facility (as recommended in Section 4) would put an upper limit on the number of tonnes emitted from a given facility, thus preventing such a sustained release. A maximum hourly emission rate would act as a facility-specific cap. This defines a limit on emissions from a firm that might be banking, thus providing some assurance of environmental protection. Ambient standards should also be relied upon, and strengthened if necessary, to provide environmental protection.

If such an emission rate were not developed, it may be appropriate instead to attach rules to the use of banked coupons, restricting the timing and location of their use and requiring pre-approval of use. It may also be necessary to set an annual cap on the number of banked coupons that can be used in particular areas.

However, banking is undermined by measures that reduce the confidence of depositors of surpluses that their deposits will be safely held (CCME 1992:42-44). Restrictions on use could discourage banking, preventing the environmental benefits that would have resulted from firms advancing their control schedules.

At the extreme, is confiscation of banked coupons. In the U.S., some firms feared that if they identified banked reductions, regulators would tighten standards to eliminate them, and in 1990, a California regulator decided to devalue banked permits from shut-down plants by 80 percent (NERA 1991:40).

RECOMMENDATION 32: *Banked coupons must not be confiscated or devalued.*

3.3 Futures Markets

Futures markets, or hedging, allow investors to lock into a future price for a commodity, thus reducing investment risk. In the case of the share and coupon market, program participants, having decided to invest in either emission control or shares and coupons, are exposed to the risk that the price of shares and coupons will rise or fall in a manner that was unanticipated. A futures market eliminates that risk. This is a service that the Chicago Board of Trade has offered to buyers and sellers of SO_2 emission allowances (Major 1992). This process of buyers and sellers coming together in a centralized marketplace to bid and barter also results in price discovery.

RECOMMENDATION 33: *A futures market for coupons may accelerate trading and should not affect the environmental goal. However, introduction of this service for investors will result*

[9] NERA (1992) notes and responds to additional perceived problems with banking (p.104).

from the desires and requirements of program participants, and so government does not have to design this into the trading program.

3.4 Retiring Stations

RECOMMENDATION 34: *Any emission source should be able to close down and sell its shares and/or coupons. This incentive would have environmental benefit, given that, at present, existing point sources are not being retired, although some should be.*

Society should want to give the right signals to owners and operators of older, dirtier plants, but these facilities are treated favourably by existing regulations which have the effect of encouraging prolonged operation of older facilities because a newer replacement facility would incur an economic burden for compliance with very stringent "new source performance standards."

The ability to sell coupons and shares can change the economic signals provided to owners of older facilities. Older facilities would be shut down sooner than they might be otherwise. For a strong economy and healthy environment, this is a direction that should be facilitated rather than hindered, as it is now. Also, the capital generated could facilitate the transition to newer technology or site clean-up, although it might well be invested in an unrelated sector.

However, *if* those stations were going to retire anyway, without the incentive provided by share or coupon sale, giving retiring point sources the right to sell coupons keeps emission levels where they were before the closure.[10] The environment does not benefit in this case, although in a conventional regulatory regime it might have. This is prevented if the cap is set on ecological criteria alone, as recommended in section 1.3. But if socioeconomic considerations, such as the number of existing emitters, or the amount of economic disruption that might result from emission reduction, are used to establish the level of the cap, then the soon-to-be-retired station *does* make a difference to share allocation. In that case, information about planned and forecast expansions and closures is needed and must be considered at the time caps are set and initial shares allocated.

This tendency should be policed by competitors at the time of initial share allocation; firms have a vested interest in ensuring that their competitors do not profit unfairly from a closure (see section 2.2).

3.5 Interregional Trading

Fifty percent of sulphate deposition in Canada originates in the U.S., so anything that can be done to hasten U.S. emission reductions will benefit the Canadian environment. Since more sources in the program mean more trades and therefore greater reductions at greater economic efficiencies, international trades should be encouraged where a shared airshed straddles the border. There is provision in the Canada/U.S. Acid Rain Accord to allow such trading. However, implementing Canada/U.S. trading will be complicated, and should not be allowed to hold up implementation of the Canadian program.

RECOMMENDATION 35: *Emission trading should be restricted to Canada for the time being. International trading should be examined once all aspects of the Canadian program are working smoothly.*

Common rules and penalties will be helpful in that case, and might be considered now. For example, the "coupon/shares" terminology in this proposal is a departure from the U.S. system, and could inhibit international trades, although some think this will not be an obstacle.

RECOMMENDATION 36: *Interregional emission trading should be restricted to trades involving shared airsheds.*

[10] The 1992 NERA study, at the top of page 42, describes this scenario in the U.S., where the allocatbn was rate-based, not tonne-based, exacerbating the effect.

3.6 Interpollutant Trading

RECOMMENDATION 37: *If interpollutant trading addresses the environmental problem, it should be considered, but not until SO_2 trading is working well.*

3.7 Preventing Transparency Problems

RECOMMENDATION 38: *Competition is crucial to the smooth operation of the trading market and manipulation should not be tolerated. However, the expectation of the Acid Deposition Group is that existing legislation will address abuses, and so specific design responses to the possibility of anti-competitive actions should not be undertaken at this time.*

If a firm is not sure it will be able to affordably acquire coupons on the market at a later date, it may be inclined to hoard surplus coupons to meet possible future needs.[11] This is a possibility as long as banking of coupons is allowed, but for the following reasons, hoarding should not be considered a concern to the extent that it is addressed in program design:

- To some extent, coupon markets are self-regulating against the hoarding tendency: the more coupons that are withheld from the market, the greater their price will be and the greater the implicit cost of withholding. If hoarding did begin to occur, the price of allowances would respond by rising to higher levels and the incentive to sell allowances would become even more compelling, as greater opportunities would develop for reducing costs.
- The anti-competitive rules of the mercantile exchanges, the Anti-Combines Act, and the Federal Competition Bureau may be strong enough and effective enough to curb potential abuses. If not, there may have to be specific rules built in.

Both the federal government and the CCME made extensive submissions, through their respective economic instruments discussion papers, on how hoarding of coupons might be proscribed. None of the approaches, in the view of the Acid Deposition Group, is satisfactory, let alone necessary. CCME seems to have defaulted to the belief that market forces would not work — all their solutions are seen by industry as interventionist, and creating a disincentive to trade or invest in new technology. Such rules are not needed to prevent hoarding in the real estate market, for example. Under the terms described by CCME, industry would never accept emission trading. CCME wants industry to make investments in emissions reduction, but under these terms, the value of their investment could drop to zero.

On the volume or frequency of trading: a lack of trading activity is fine if it is due to behaviour within firms. Firms might try to reduce emissions and bank coupons in anticipation of future cap reductions, resulting in immediate environmental benefit even though there was no trade.[12] It also may be that firms are trading internally, making use of certain facilities more efficiently or reducing emissions at facilities where the marginal cost of control is lowest. Again, the cap would be met, but at lower economic cost than would have been the case without a trading program.

However, if the volume of trading is reduced because of cumbersome rules or an inability to find buyers for coupons, then reduced trading is an indication of problems with the market. For example, in the early American emission trading programs, firms were only trading for "big prizes", since the smaller efficiency gains were outweighed by the administrative burden of the trading rules. The biggest problem was that trading was superimposed on top of all the command and control rules, and there was a pre-approval requirement that took up to six months. Therefore, only big trades were worth the transaction costs

[11] A firm could also buy coupons on the futures market, were such a service offered.

[12] The environmental benefits of banking were described in section 3.2.

(NERA 1991:39-42). This meant that emission reduction efforts with both environmental and economic benefits were not being undertaken.

A few offset trades occurred in the Midwest, Maine, Massachusetts, and New Jersey, but most (about 100 in the past 10 years) have taken place in California. The pace of such trading has picked up recently, driven by publicity about the Clean Air Act. It is expected that the Chicago Board of Trade will play a role in bringing transparency to the U.S. SO_2 market and in bringing buyers and sellers together. The Exchange will auction annually, on behalf of the Environmental Protection Agency, a small number of SO_2 credits. It also plans to create a futures market in SO_2 credits (see section 3.3).

Transparency is important when it comes to testing for effective operation of the market and preventing monopoly control. Reduced trading may be a signal that increased transparency is needed. Market forces by their nature will lead to the emergence of brokers and exchanges, which would fill some transparency requirements. Government would not have to assume a role in establishing this capability, but would have to monitor program effectiveness and be prepared to address any market weaknesses if this becomes necessary.

RECOMMENDATION 39: *The federal Department of the Environment should solicit specific proposals to answer questions about operation of the market, behaviour in the market, and market liquidity, focusing on the adequacy of existing tools.*

CHAPTER 4
PERFORMANCE REQUIREMENTS

RECOMMENDATION 40: *Every tonne of SO_2 emitted must be accompanied by retirement of a SO_2 emission coupon.*

RECOMMENDATION 41: *All program participants will have facility-specific operating terms and conditions specified in their Licence to Operate (or their Permit, depending on the jurisdiction), developed through discussions with government and local stakeholders. This will include a defined maximum hourly emission rate limit, based on health and environmental criteria.*

The maximum hourly rate is designed to address concerns related to acute, short-term impacts that might arise, usually on a local geographic basis due to emissions from a specific facility. It is meant to ensure that under normal operating conditions, a plant will not be allowed to risk non-attainment of desired local ambient air quality.

RECOMMENDATION 42: *The maximum hourly rate should be derived by dispersion modelling methods approved by the Minister of the Environment to ensure that applicable maximum hourly ground level concentration and ambient air quality objectives are not exceeded. The modelling work should take into account other area sources so that the cumulative impact of all facilities in an area is considered.*

Best available knowledge of the interactions of multiple local sources must be taken into account when designing ambient air monitoring programs and in establishing maximum hourly emission limits for individual facilities.

RECOMMENDATION 43: *Models can be used as a tool to assist in predicting the behaviour of multiple sources, but these are models and, as such, cannot be relied upon completely to guarantee actual outcomes. The following mechanisms should be used if, despite compliance with the cap and the maximum hourly emission rates, unanticipated local ambient problems arise.*

43.1 *The Minister could intercede when licensed performance limits (e.g., maximum hourly emission rates) specified in a Licence to Operate are causing unanticipated environmental and/or human health concerns. The Minister would initiate a licence review and revision to correct the problem.*

43.2 *Operators in a given area could cooperatively develop a course of action to address an ambient air quality problem by adjusting their operating practices or developing and implementing a cooperative response strategy. Such mechanisms are currently employed in some jurisdictions in the event of ambient exceedences of SO_2.*

43.3 *Enforcement provisions in most jurisdictions in Canada would allow the government to issue a stop order or control order, which either shuts down a facility if it is causing immediate risk, or specifies corrective action to be taken in a specified time frame. This could involve specifying that a plant modify its maximum hourly emission rate. Exceedence of ambient air limits would be one such trigger for this action.*

43.4 *The public should have the ability to initiate an investigation if there is concern regarding a specific facility or regional environmental conditions. This is the case in Alberta. In provinces where such a mechanism does not exist, it should*

be put in place before a trading program is implemented.

RECOMMENDATION 44: *Under all circumstances, a facility must comply with its licensed operating terms and conditions, including its maximum hourly rate, regardless of its coupon or share holdings.*

The maximum hourly rate has the effect of placing a limit on the daily amount emitted (24 hours x maximum hourly rate) and thereby the annual amount emitted. This would prevent concentration of use of emission coupons at one facility, and serve to limit a facility's use of banked coupons to a level that will not damage local environments. If an exceedence occurs, it should be investigated and appropriate action taken.

RECOMMENDATION 45: *Other performance specifications as deemed necessary by the Minister of the Environment, for example stack design parameters for new facilities, should continue to apply according to the Terms and Conditions of the Licence to Operate. Conditions no longer applicable should include percent sulphur recovery limits and daily or annual maximum emission rates.*

Percent sulphur recovery limits were not based on environmental rationale: they were based on available technology, and this is what created local environmental problems.

CHAPTER 5
MONITORING AND REPORTING

RECOMMENDATION 46: *Program participants should measure the concentration of SO_2 in the flue gas and the volume of flue gas emitted to determine total tonnes of SO_2 emitted at a given source over time.*

RECOMMENDATION 47: *The method of measurement should be specified by the regulator according to the Air Quality Monitoring Directive issued by the Minister of the Environment.*

RECOMMENDATION 48: *Stack surveys should be conducted at a frequency specified in the Licence to Operate, according to Ministry of Environment requirements, and should be subject to on-site observation and investigation by Ministry inspectors. Violation of the maximum hourly rate and ambient standard would trigger an investigation and appropriate enforcement response. Audits would also be conducted occasionally and randomly, independent of complaints or violation of ambient standards.*

RECOMMENDATION 49: *All monitoring data, including calibration data for measurement equipment, should be retained by program participants for at least five calendar years.*

RECOMMENDATION 50: *The Minister of the Environment should request production data from the proponent or any other government agency for the purpose of verifying reported emissions.*

RECOMMENDATION 51: *The Minister should audit current and past data, as necessary and with no prior notice, to ensure compliance with program requirements. Failure to provide data or falsification of data should be considered a punishable offense.*

RECOMMENDATION 52: *Coupon/share holders should report the tonnes emitted and the status of their coupon and share holdings quarterly, using a specified form; one example is illustrated in Figure 2.*

RECOMMENDATION 53: *Any change in ownership of shares or coupons should be registered with the appropriate government or administrative agency, depending on the province, within two business days following conclusion of a transaction. The information provided on the transaction should include the number of shares or coupons transferred and the price at which the transaction occurred. The commercial terms of any specific arrangement should be kept confidential.*

RECOMMENDATION 54: *The government should reserve the right to make general price information available for program participants as necessary to assist in the functioning of an effective market.*

RECOMMENDATION 55: *Neither brokers nor commodity exchanges should be precluded from involvement in the market.*

RECOMMENDATION 56: *Further study should be conducted to determine what monitoring equipment is currently in place, what is available and appropriate, and what monitoring upgrades would be necessary in a trading program.*

Monitoring the quality of ambient air is critically important to air quality management, independent of the regulatory approach applied. It is important to identify areas for improvement in the ability to measure and analyze ambient air quality as part of an effective air quality management program. Monitoring of ambient air quality typically takes the form of continuous measurement equipment

Figure 2. Example of a Reporting Form

CREDITS

Ending coupon balance, previous quarter [from line n1 of last quarterly report]	(c1)	41.0
Coupon allocation based on shares held (396 shares x 0.1 75coupons/unit/quarter) [attach copy of form X1 if any shares purchased or sold during quarter]	(c2)	69.3
Coupons purchased [attach form X2 for each purchase]	(c3)	0
Total credits (c1+ c2 + c3)	(c4)	110.3

DEBITS

Total SO_2 emissions during quarter (in tonnes) [attach form X3 for each registered source]	(d1)	56.7
Coupons sold [attach copy of purchaser's form X2 for each sale]	(d2)	25.0
Total debits (d1+ d2)	(d3)	81.7

NET POSITION

Ending coupon balance (c4 - d3) [attach penalty form X4 if balance is less than zero]	(n1)	28.6

Source: *from Nichols and Harrison, 1990* (cited in NERA 1992).

located at sites approved by the regulators. The programs generally have been designed to test for compliance of individual facilities with established maximum ambient air standards or objectives within a given jurisdiction. There is a growing recognition that current resources used to monitor ambient air quality could be better applied if a coordinated approach were taken to monitoring on a regional basis rather than a facility- specific basis. In addition, given that the data are generally captured electronically, there is the potential to improve the way data are managed and used to support decision-making.

RECOMMENDATION 57: *Improvements in ambient air quality monitoring should be included in the scope of work required to ensure that an emission trading program will achieve society's desired environmental objectives.*

CHAPTER 6
ENFORCEMENT

RECOMMENDATION 58: *If a facility has emitted more tonnes than its coupon holdings allow at the end of any calendar quarter, the facility should have thirty calendar days following the end of the quarter to acquire coupons equivalent to the amount of the imbalance, such that its actual emissions are at least equal to its coupon holdings.*

RECOMMENDATION 59: *If an imbalance remains following this thirty-day period, a fine of $2500 per tonne*[13] *and a requirement to retire coupons at a ratio of two coupons for each tonne in exceedence should be imposed and an Enforcement Order issued, which could lead to prosecution. Fines should be used in a manner to be determined by the relevant jurisdiction, but the Acid Deposition Group recommends that revenue from fines not be directed to general revenues.*

RECOMMENDATION 60: *The Enforcement Order should include any other provisions as specified under legislation (such as a control order or stop order).*

13. A fine of $2500 per tonne is the level of the U.S. SO_2 fine, which should be consistent with the Canadian fine for FTA/NAFTA reasons, especially if international and interpollutant trading are eventually allowed.

CHAPTER 7
NEXT STEPS

The Acid Deposition Group recognizes that further refinement of its proposed emission trading program and resolution of some outstanding public policy issues regarding emission trading, will be best achieved through broad public discussion in the context of possible implementation in a specific region. Therefore, the Group recommends:

RECOMMENDATION 61: *Public discussions regarding implementation of a demonstration project for SO_2 emission trading in Canada should be initiated.*

The design recommendations outlined in this report should be used as a starting point for such public debate. The Group recognizes that the outcome of the public debate could be a recommendation that emission trading should not be implemented yet. Alberta is particularly well-positioned as an area for a demonstration project for the following reasons:

- Alberta has developed a Clean Air Strategy, which includes a management process to support ongoing multi-stakeholder decision-making related to air quality. This process supports the decisions required to make emission trading work, including cap setting and management.
- The Alberta Environmental Protection and Enhancement Act has included an enabling provision that empowers the Minister of the Environment to make use of various forms of economic instruments for environmental protection, including emission trading.
- The Alberta Round Table on Environment and Economy (ARTEE) has sponsored several workshops with industry, government, and non-government organizations, which included discussion of tools such as emission trading. Stakeholders are becoming familiar with the concept and there is general interest in exploring the opportunity further. The ARTEE has recommended that market-based approaches be applied to addressing environmental issues as a way of making progress from both an economic and environmental perspective, consistent with sustainable development.
- Alberta has enough SO_2 point sources (approximately 290) with significant variance in costs of emission control to suggest that emission trading has a good chance of success in reducing upcoming abatement costs.
- Emission trading in North America typically has been undertaken only in situations where significant remedial action is required. Alberta has an opportunity to demonstrate how emission trading might be used to prevent the need for such significant remedial action, through proactive use of a tool that allows explicit goals to be set and provides the flexibility for participants to seek innovative and more cost-effective actions. While volume of trading and size of financial benefits might be lessened under these circumstances, it is expected that significant cost savings could still be realized in comparison to maintaining the current regulatory programs.

RECOMMENDATION 62: *This report should be used as a basis for national discussion as to how emission trading might be used to address the acid deposition problem.*

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APPENDIX

SO_2 ABATEMENT MECHANISM ASSESSMENT: A Comparison of Emission Trading, Emission Charges, and the Status Quo

1. Traditional Regulation

Governments have traditionally employed "command and control" regulations, under which the central government typically instructs its pollution control agency to issue uniform technology-based standards... Under the traditional model, a uniform BACT (best available control technology) rule would require all enterprises to employ the same control technology. Alternatively, a rule could require BACT in a separate, case-by-case determination for each enterprise...A different, somewhat less restrictive approach that stands between the pure "command and control" and pure market-based ends of the spectrum is a performance standard requiring all plants to meet a uniform or location-specific performance goal, such as an emissions rate. Because a uniform performance standard approach theoretically leaves to the private enterprise some flexibility in the selection of control technologies and methods to achieve the performance goal, it has some attributes of a market-based incentive. In practice, however, performance standards have often been defined so specifically that they require a specific technology for most plants. Additionally, the performance standard is insensitive to differences in the costs and opportunities facing different plants; it still requires every plant to accomplish the same emissions reduction even if the same total reduction could be achieved at less cost by letting some plants control more while others control less.[14]

1.1 Disadvantages[15]

- Insensitive to the costs and benefits of installing a particular control technology at each site.
- Technology standards discourage innovation in control technologies. There is no incentive to make scrubbers, for example, more efficient or cost-effective than what is necessary to meet the regulations.
- Technology-based regulations have typically required the installation of end-of-the-pipe control devices, mechanisms that treat or scrub the pollutants as they are emitted from the plant or as they are put in disposal sites. This discourages improvements in efficient use of resources because businesses have no incentive to conserve fuels, or otherwise minimize emissions, once the control technology is in place.
- The technology-based approach tends to result in far more stringent controls on new plants than on existing plants.
- Wasting pollution abatement dollars could turn public opinion against pollution control.

2. Emission Charges

A fee can be attached to each unit of emissions, effectively forcing the emitter to internalize — that is, incorporate in its own cost and pricing calculations —the costs that the emissions impose on society. Each emitter will reduce emissions to the point that its marginal costs of control become as expensive as paying the fee. This point will vary for each emitter, but the aggregate emissions

[14] Dudek, D., R. Stewart, and J. Wiener. 1992. "Environmental Policy for Eastern Europe: Technology-Based Versus Market-Based Approaches," *Columbia Journal of Environmental Law*, 17(1):8-9 [to be referred to hereafter as "Dudek et al. 1992".]

[15] Dudek et al. 1992:11-14.

reduction will correspond to the size of the fee exacted.[16]

2.1 Design Assumptions[17]

- National program
- Common charge for all emitters
  Option: charge varied according to each region's environmental sensitivity, or to each region's valuation of its environment
- Government would collect revenue from charges
- Revenue neutral; that is, offsets other tax
  Option: revenue goes to the regions accepting the waste
- Replaces existing command and control rules
  Option: charge used in addition to existing "command and control"
- Applies to individual point source emissions
- Retains current monitoring (Continuous Stack Emission monitoring) and ambient air quality standards

2.2 Advantages

- Certainty over costs to industry. Likewise, there is certainty as to the amount of government revenue raised by the charge, but raising revenue is not an environmental objective.
- Cost of pollution is explicitly recognized, internalized, and, in some cases, passed on to the consumer, giving a price signal about the cost of consumption, and providing strong incentives to conserve. The exception to this is in the case of globally traded commodities, where the ability to pass on additional costs to customers is limited. To deal with an emission charge, oil companies, for example, could cut costs in other ways, but could not add the cost of the charge to their final price. Electricity producers, on the other hand, could.
- Should reduce abatement costs and administrative burden, and ease implementation by replacing "command and control" rather than adding to it.

2.3 Disadvantages

- No certainty as to the total quantity of emissions, because:
  1. It is difficult to anticipate the response to the price of the emission charge.
  2. There is no emissions cap constraining the total quantity of emissions.
  3. "Command and control" regulations prescribing particular control technology have been removed.

This makes an emission charge particularly ill-suited to the acid deposition problem, for which a federal cap on emissions has been established. With controls removed, and the only incentive to reduce emissions being a negative one (that is, avoiding the charge), the environmental benefit is uncertain, to say the least.

Option: Set a national cap to control total emissions, allocate allowable totals on a regional basis, and set an emission charge. The only difference between this and a trading system would be that point sources wouldn't be able to sell credits for emission reduction. But, if one were willing to go this far, why not go the whole way and capture the benefits that the trading system's innovative aspects provide?

Option: "Command and control" could be combined with an emission charge system: a polluter would be required to reduce emissions to a specified level, using prescribed pollution control technology, and would also be charged for each tonne of SO_2 emitted. This would be seen, quite rightly, as extraordinarily and unnecessarily burdensome, and would carry with it all the

[16] Dudek et al. 1992:18.

[17] used for discussion purposes

problems associated with "command and control's" inflexibility.

- No certainty as to where emissions will occur, since the response to the charge will be more or less consistent across the country. This is an environmental disadvantage, as damage from acid deposition varies regionally, in accordance with soil sensitivity. Ambient standards could give some comfort.

  Option: Varying emission charges regionally, rather than imposing a standard national charge, would indicate the relative value of reducing emissions in a particular region, and would provide greater certainty as to where emission reductions will be made. However:

  i. a regional charge still provides no assurances as to the volume of reductions, due to uncertainties over the response to price;

  ii. where "hot spots" cross jurisdictional boundaries, administration and revenue collection will be especially difficult;

  iii. revenue redistribution would also become a difficult political issue; and

  iv. it might be difficult politically to establish disparate emission charges on regional lines.

- High risk exposure for industry: the emission charge may have to be revised upwards if it becomes apparent that the charge is not high enough to influence behaviour to the extent that SO_2 reductions are achieved. In fact, such revision is to be expected, given the uncertain nature of pricing natural resource use. In such a scenario, industry would have reason to argue that they had no warning of such a change, and might pose the threat of plant closure and job loss.[18] For this reason an upward revision of emission charges might be difficult to achieve and, if it were, it might be at the cost of industry's receptiveness toward emission reduction.

- There is no incentive to cut emissions at all if the pollution control installation costs more than the emission charge. As in a "command and control" regime, polluters get the message that it is bad business practice to reduce emissions beyond what reductions are required and beyond what their competitors have done, and that there is no financial reward for protecting the environment beyond a certain level.

2.4 Issues Requiring Resolution or Response

Should the level of the charge be determined by the estimate of the external environmental damage caused by the emissions, or by the price level that would discourage consumption?

3. Emission Trading

Under a tradable allowance scheme, a central agency imposes a constraint on the total quantity of emissions. The agency then issues allowances adding up to that total and allows emitters to reallocate allowances among themselves. Alternatively, the agency sets a phaseout schedule and lets firms who achieve reductions ahead of schedule earn credits that can be traded to other firms. The aggregate emissions cannot exceed the centrally determined total level, but the amount of emissions controlled by any individual emitter may vary so long as it holds allowances for each unit of its emissions [and meets local ambient air standards]. *Those who can control emissions more cheaply than others will sell excess allowances at a profit, while those for whom control is more expensive will purchase allowances. The market price of an allowance is, in principle, the same as a fee on emissions to achieve the same reduction,*

[18] However, there is no reason that the price for environmental services should be the only guaranteed price in a dynamic economy; businesses every day make investments that end up being more or less economic than originally anticipated because of price changes. (Larry E. Ruff. 1991. *Internalizing Environmental Costs in Electric Utility Decisions.* Putnam, Hayes and Bartlett, pp. 12-13.)

in that it forces purchasers to internalize the costs of their excess emissions. Allowance trading differs, however, in that to achieve the same reduction, the marginal price for a unit of emissions is determined by market interactions rather than by government edict.[19]

3.1 Design Assumptions

- three trading regions: Ontario/Quebec; Manitoba/West; Atlantic

  Option: one trading zone — all of Canada

  Option: trading zone for each municipality or county

- cap set at current actual tonnes of SO_2 emissions from all sources, not just those sources included in trading program

  Option: cap reduction built in

  Option: cap set according to rates of emissions, rather than tonnes

- coupon = 1 tonne SO_2

- coupons are initially given free to existing polluters in proportion to their existing pollution; newcomers must enter the market by purchasing coupons. The number of coupons must be finite.

  Option: coupons are auctioned at the point of initial distribution

  Option: coupons are given free to existing polluters, but some coupons are withheld and auctioned to new entrants each year

- initial allocation of coupons is made to existing emission sources based on historical emissions, on the average of the last three years' actual emissions from each point source, with adjustments being made to take into account any prior emission reduction actions already taken by firms.

  Option: to deal with exceptionally dirty companies, a basic standard or efficiency rate might be set; e.g., SO_2 emissions per unit of production; historical fuel use multiplied by emission rate/Btu; or some criterion of current good practice such as Best Available Technology or "new source performance standards." Those few that don't meet the standard would be assigned coupons only on the basis of that allowable emission limit.

- no expiry date for coupons; banking is allowed

- ambient standards are retained; ground level concentrations of SO_2 are measured

- monitoring and reporting of "actual vs. allocated" emissions are required

- register trades with government after the trade is made

  Option: pre-approval required for all trades, or for trades between zones

- replaces "command and control" regulations

- a process for setting and managing the cap is created

3.2 Advantages

- Provides certainty as to the quantity of SO_2 emitted. In every case where a cap is set, an absolute target level of pollution is determined.[20]

- The cost of pollution is passed on to the consumer, providing a valuation of resource use, for commodities other than those globally traded. This price signal should affect product consumption. However, this price gets established only if there is a coupon purchase through a trade.

  If coupons are auctioned at the point of initial allocation, this value is established immediately.

[19] Dudek et al. 1992:18-19.

[20] Neither the cap nor its regional allocation should be increased beyond the original determination, once set. Businesses will have made environmental investments in good faith and with the expectation that their value could only stay constant or appreciate. Raising the cap would cause coupon inflation, and would be equivalent to printing "environmental currency".

- Creates an incentive for innovation. Each point source is rewarded for reducing emissions below its allocated amount when there is a market for coupons. In a "command and control" regime, emission limits are determined by existing control technology, but in a trading regime, the development of new control technology is accelerated and encouraged. This will happen not only within a firm but from the outside, where expertise will be sold, or where one polluter will enter a competitor's facility and pay to capture reductions and associated coupons. Having the flexibility to choose between control technology or process modification means industry can look at "inputs" — the sulphur content of coal, for example — as well as the traditional "end-of-the-pipe" control solutions. This has great environmental benefits.

  Some pollution abatement equipment suppliers are manoeuvring now to take advantage of the market trading schemes. Pure Air, a joint venture of Mitsubishi and Air Products & Chemicals, proposes to install sulphur dioxide reduction equipment at a customer's site. Pure Air would own and operate the installation and guarantee to meet reduction targets. It will sell excess allowances for its own profit, or purchase additional allowances at a loss to itself to bring its customers into compliance. Noxso, a Pittsburgh-based firm, proposes to do much the same, but will offer reductions in nitrous oxide in addition to sulphur dioxide using a chemical sorbent system.[21]

- Removes innovation barriers imposed by "command and control." Regulating installation of specific control technology, as "command and control" does, allows one technology to capture the market, force out other technologies, and eliminate industry incentive to develop new control strategies. Once government has chosen a control technology, it is slow to revise its determination in light of new research.

  In the U.S. before trading was proposed, Best Available Control Technology requirements for new sources went up to 90 percent SO_2 removal — the highest thought technically possible. Now, with trading and performance incentives, industry is ordering newly devised technologies that remove 95 or even 98 percent of SO_2.[22]

- Focuses on least-cost solutions to air quality problems, thereby reducing compliance costs for industry. Trading allows business and consumers to transfer investments in pollution control to those places where pollution control is least expensive — where the most pollution control can be achieved for each unit of resources expended. For industry and consumers, this means that environmental protection is more affordable than it would otherwise be. To the environment, this offers the hope that industry will get more environmental savings from its environmental budget. Approaching environmental protection in the most economically efficient manner ensures that other social goals are not deprived of badly needed capital, and that the perception that environmental protection is too costly does not become entrenched. For example:
  In the U.S. emissions trading will offer utilities significant opportunities to reduce costs and electricity rates. For example, in 2005, Pennsylvania is forecasted to make $25-75 million of "returns" on emission reduction "investments", reducing average levelized electricity rates to consumers by 0.2-0.6 percent.[23]

The California South Coast Air Quality Management District's (SCAQMD) emission trading proposals are slated to take effect in 1994. Facilities that emit four tons or more of a controlled pollutant annually are affected. In the case of hydrocarbon-emitting facilities, that would include 2000 businesses in the area. The program's goal is to reduce hydrocarbon emissions by six percent, nitrous oxide by eight

[21] Reisch, M. 1992. "SO2 Emission Trading Rights: A Model for Other Pollutants," *Chemical and Engineering News 70:21-22.*

[22] Dudek et al. 1992:30.

[23] Elman, B., B. Braine, and R. Stuebi. 1990. "Acid Rain Emission Allowances and Future Capacity Growth in the Electric Utility Industry," *Journal of the Air and Waste Management Association* 40:979-986.

percent, and sulphur oxides by eight percent annually using average annual emissions between 1989 and 1991 as a baseline. Costs to business to meet the emission reductions would be almost half the US$3 billion projected between 1994 and 1997 if the "command and control" system now in use were still in effect, according to a SCAQMD spokesman. EPA estimates that (the U.S.) sulphur dioxide trading program will save boiler operators US$1 billion.[24]

- Costs to industry of pollution control become visible and manageable. This cost transparency provides the information necessary to make further investments in emission reduction. An environmental manager in a company can go to its board and announce that, with a technology improvement, "X" dollars can be saved. Improving environmental performance can be presented as a business opportunity rather than an expense. In a "command and control" regime, on the other hand, compliance costs are non-discretionary and therefore not usually tracked.

- Creates a lobby for pollution control. Every holder of a permit has an asset whose value declines if the government raises the cap, or lowers it more slowly than planned. This lobby prevents the government from making "exceptions" for specific areas or polluters.

- Increased pollution control compliance, relative to a "command and control" regime. Violation of a trade (if emissions from the seller were not reduced in proportion to the emission coupons sold) is subject to criminal prosecution, which gives industry a particular incentive for accuracy. Industry becomes a regulator, to prevent cheating, and all shareholders become watchdogs. With industry, brokers, and government regulators all scrutinizing trades, non-compliance is much less likely to go undetected.

- Political intervention is minimal, decreasing the possibility of political considerations dictating environmental policy and enforcement. With so many players involved, the opportunities for political manipulation are reduced.

- Decreases governments' costs, since "command and control" regulations are replaced.[25] Because income tax will recognize transactions due to the change in industries' bottom lines, government can benefit from the revenue created by trading transactions.

- Increases emission monitoring, due to contractual obligations and regulatory program requirements. This will be costly, but costs are recoverable.[26] And all coupon holders become watchdogs for free, reducing overall costs since greater monitoring incentives have been created.

- Targets specific geographical areas for emission reductions, by allocating the cap among regions. This could be politically difficult, although less so than in an emission charge system.

- Does not compromise reduction of non-target pollutants, as can "command and control" regulation. For example, in the U.S., requiring scrubbers in order to reduce SO_2 increased CO_2 emissions. In contrast, if tradable allowances rather than technology mandates were implemented, utility CO_2 emissions could be reduced because emission trading encourages fuel conservation, while mandating scrubbers does not.[27]

- Does not discriminate against modern plants, as does "command and control." An emission trading system imposes a burden on every unit of emissions from every plant irrespective of its age, and encourages new clean investment that replaces older and dirtier facilities. On the other hand, "command and control" tends to place far

[24] *Chemical and Engineering News, volume 70, July 1992.*

[25] Canadian Council of Ministers of the Environment. 1992. *Emission Trading: A Discussion Paper.*

[26] CCME. 1992:29, 49-51.

[27] Dudek et al. 1992:15-16.

more stringent controls on new plants than existing ones, imposing a disincentive on new plants and encouraging business to run older, dirtier plants longer.[28]

- Encourages the closure of especially dirty plants. The opportunity to sell coupons may provide the incentive needed for the most polluting companies to close down.[29]

- Provides greater certainty and speed of reaching environmental targets than do standards in the existing system. Standards provide little assurance of reaching overall targets, because they almost always set rates of emissions per unit of input or output. As a result, total emissions can vary widely depending on the strength of the economy, relative fuel prices and similar factors. In contrast, the trading plan would set a cap each year; although banking would lead to some variation in overall emissions from year to year, the swings should be substantially less than with standards.

  Trading also may allow the government to reach its environmental targets faster. The rate at which standards can be phased in often depends on the rate that is feasible for the slowest segment of the industry; otherwise, the government risks forcing companies to close plants that cannot meet the rules fast enough. With trading, however, the pace can be faster, because the slow firms have the option of buying coupons from faster firms until they can install new controls.[30]

- Allows retirement of coupons by environmental and citizens' groups, or government.

- Distribution of coupons as an initial allocation mechanism provides a greater degree of equity, certainty, and security than do other allocation schemes. Distribution seems the fairest, least disruptive, and most predictable allocation mechanism, because all the players will be pretty much the same after the allocation as before it. Free distribution avoids a problem that an auction presents: since existing emitters have already incurred costs to meet "command and control" regulations, the auction represents a cost incremental to that which they have already borne to obtain the right to pollute.

  Option: An auction could imply:

  i. more social disruption due to plant closures, if having to pay to pollute, where that privilege had always been free of cost, sends companies over the financial edge;

  ii. more opportunity for anti-competitive actions: the large firms could seek to bid up the price of coupons as a means of driving their weaker competitors out of business; monopolies on coupons could result in only the largest and richest companies being able to afford to buy them, shutting the small companies out and creating job loss;

  iii. less certainty for existing polluters as to the availability of pollution permits.

  Distribution for existing polluters and an auction for new entrants might capture the best of the two distribution options.

3.3 Disadvantages

- An explicit valuation of atmospheric resources is not guaranteed. Coupons are given away free and, without a cap reduction to stimulate trades, the resource price may not be clearly established.
  An auction, on the other hand, would force the establishment of a guaranteed and explicit value, visible right away, for the right to pollute SO_2. In the absence of an auction, coupon purchase through trading will establish that price, but trading might happen only if there is a reduction in the national emission cap. So, if there is a scheduled cap

[28] Dudek et al. 1992:13-14.

[29] CCME takes a very different view of this issue, pp: 46-47.

[30] NERA, draft Ontario NOx/VOC report, November 1992: S-15.

reduction, coupon distribution is preferable. If there is no cap reduction, coupons must be auctioned. Otherwise, we'd be much better off with an emission charge system.

- Uncertainty as to the cost to industry of coupon purchase. Compared with an emission charge regime, in which the costs of emitting a tonne of SO_2 are known up front, polluters seeking additional coupons face uncertainty as to coupon price, being demand-driven. However, this is no more uncertain than any other tradable commodity. Also, the cost of SO_2 emission control equipment is well-known, and can guide coupon investment decisions.[31]

- Polluters, in anticipation of the coupon allocation, could boost their SO_2 emissions to increase their three-year average and therefore the size of their allocation, in order to profit from coupon sales. This might be prevented by counting three years backward from the date of first discussion of the trading system.

- The polluters at the extreme ends of the spectrum might not be dealt with fairly by the three-year-average allocation. The cleanest companies, having made pollution control investments ahead of their time would, in effect, be penalized by being underallocated relative to their competitors. The dirtiest companies would receive a very large allocation and could profit by making the same retrofits that their clean and unrewarded competitors had made years ago.

To deal with exceptionally dirty companies, a basic standard could be set, possibly an efficiency measure such as: SO_2 emissions per unit of production (although finding a common denominator might be difficult); historical fuel use multiplied by emission rate/Btu; or some criterion of current good practice such as Best Available Technology or "new source performance standards", as suggested in the CCME paper. Those few that don't meet the standard would be assigned coupons only on the basis of that allowable emission limit. This could prevent the inadvertent rewarding of companies that were slow to implement pollution control measures.

[31] This is not the case for pollutants such as CO_2 where the control technology is not well developed.

THE ECONOMIC INSTRUMENTS COLLABORATIVE REPORT

REDUCING GROUND-LEVEL OZONE

The NOx/VOC Working Group

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REDUCING GROUND-LEVEL OZONE

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EXECUTIVE SUMMARY

This report presents recommendations concerning the choice of the most appropriate economic instrument for addressing the issue of Canadian greenhouse gas (GHG) emissions, and the context in which such an instrument might be applied. It represents the consensus position developed by the Climate Change Group of the Economic Instruments Collaborative, a group of individuals from environmental organizations, industries and the National Round Table on the Environment and the Economy, who came together to carry out this task. Government observers were present throughout the process. The members of the Climate Change Group are conscious of the concerns that exist with respect to greenhouse gases. These concerns will generate some responses in terms of policies and actions. The approach and recommendations of this report with respect to economic instruments are offered as a framework and pathway for policy and action that is, in the shared view of the group, superior to responses that might otherwise be adopted.

The Climate Change Group approached its work with the dual objectives of meeting both environmental and economic interests. While the task of detailed design of an economic instrument for managing Canada's greenhouse gas emissions is not completed, an encouraging degree of consensus has been achieved on many of the conceptual issues. The report identifies several areas where further work must be done. Recommendations are made as to the kind of instrument that Canada could adopt to meet both environmental and competitiveness concerns, and the process and framework that should be followed in its adoption.

This report was researched and authored based on the guiding principles which are supported by the entire Economic Instruments Collaborative.

Despite considerable uncertainty in the scientific community about the long-term effects of increased levels of greenhouse gases, and uncertainty also about the social, economic, and environmental impacts of various possible strategies for reducing these emissions, the need for certain prudent, precautionary measures in the next decade is widely accepted. Debate continues, however, about the degree and urgency of action.

The Climate Change Group believes that, within the context of a broad Canadian strategy for addressing greenhouse gas emissions, there is potential for economic instruments to play an important role in encouraging cost-efficient action. Without agreeing on the appropriateness of the commitment, the Group has accepted, as an initial goal for the purpose of this exercise, Canada's undertaking to stabilize net greenhouse gas emissions at 1990 levels by the year 2000. The need to revisit this goal as new information becomes available is stressed by the Group. The setting of environmental goals, the design of the economic instrument to achieve them, and the monitoring of progress toward them will all reflect the changing elements of uncertainty which now characterize the climate change problem, and will continue to do so for some time to come.

A number of contextual issues shape the framework in which economic instruments could be applied. The instruments should be seen as part of an overall strategy, which would include:

- the examination and where appropriate, the removal of subsidies;
- the removal, where possible, of barriers that currently prevent so-called "no-regrets" measures[1] from achieving their potential; and
- an ongoing role for regulatory mechanisms.

Voluntary investments (above and beyond "no-regrets" measures) in projects designed to reduce net emissions, either in Canada or abroad, should be encouraged by establishing a process for registration of such measures (actions for credit). If and when an economic instrument is implemented, previously registered, qualified, voluntary actions would be able to earn credit against the financial burden imposed by the instrument.

Climate change cannot be considered in isolation from the other environmental impacts associated with economic activity. The need to develop temporary measures to prevent the substitution of one kind of environmental impact for another is identified.

The Climate Change Group briefly reviewed a number of economic instruments that might be appropriate, before agreeing to focus on broadly based instruments capable of sending price signals through the entire economy — instruments that will encourage both a change in consumer behaviour as well as innovation by both users and producers. Alternative instruments include charges on emissions, and/or tradable permits that impose a fixed cap on emissions within a given area; either could be applied at the level of the producer/importer or consumer/emitter.

Major design considerations influencing the choice among options include:

- the need to avoid damaging the competitiveness of Canadian industry;
- concerns about disparity of impact on different sectors and regions of Canada; and
- the need to provide flexibility for adaptation as knowledge and experience are gained.

All Group members see international offsets (allowing credit for greenhouse gas emission reductions or for carbon dioxide sequestering outside of Canada) as a valuable and cost-effective supplement to in-Canada actions. Consensus has not been reached about the extent to which overseas actions should be accepted as a substitute for domestic reduction of emissions in achieving the stabilization goal.

A number of gases contribute to the greenhouse effect. The Group agreed that economic instruments which covered a broad range of greenhouse gases are appropriate for cost effective achievement of Canada's goals. This led to the development of a hybrid instrument that relates specifically to carbon dioxide through a charge mechanism and, more broadly, to other greenhouse gases through an offset credit mechanism. The role of carbon dioxide in climate change is better understood, and economic methods for pricing it are more easily implemented than are those for other greenhouse gases. However, in order to promote cost-effective achievement of the environmental goal, other gases can be accommodated through a system of offset credits, within an instrument initially focused on carbon dioxide.

The Group's findings are summarized in the following recommendations, along with a reference to the appropriate section of text with further discussion.

[1] "No-regrets" measures are measures taken by governments, businesses, or institutions that result inemission reductions and that meet the normal economic investment criteria that are used for any other investment decision. The classification depends to a great extent on the organization's cost of capital and required payback period or rate of return.

PREAMBLE

Differences Between Sulphur Dioxide (SO_2) and Ground-level Ozone

The NO_x/VOC Group found itself addressing an atmospheric chemistry issue different from that studied by the Collaborative's Acid Deposition Group, which focused on SO_2. Sulphur dioxide is a relatively straightforward "primary pollutant"; a tonne of SO_2 emitted from any source bears a direct linear relationship to the overall acid loading to the environment. In contrast, ground-level ozone is often called a "secondary pollutant", because it is not emitted directly by vehicles, power plants, or manufacturing facilities. Instead, it forms spontaneously when nitrogen oxides and volatile organic compounds react in the presence of sunlight and at warm temperatures. The amount of ozone formed depends on the ratio of NO_x to VOCs in the atmospheric mixture. Under certain conditions, ozone formation may be limited more effectively by controlling NO_x rather than VOCs, and under other conditions the reverse may be true. Volatile organic compounds create a further complication in that they vary greatly in their propensity to contribute to ozone formation.

Sulphur dioxide and ground-level ozone also differ in the nature of their environmental impacts. In the case of SO_2, environmental damage increases gradually with cumulative loadings over many years. In contrast, ozone damage occurs during short episodes measured in hours or days, after which the ozone breaks down into oxygen. In other words, cumulative loadings are not a concern for ozone. This distinction becomes important in a discussion of issues such as banking of coupons, as proposed under a trading program.

Aside from chemistry, there are other differences between the SO_2 issue and the ground-level ozone issue. Sulphur dioxide sources are relatively few in number and are, for the most part, stationary, permitted sources. Emission sources of NO_x and VOCs, on the other hand, are both numerous and very diverse, encompassing literally hundreds of thousands of mobile sources, as well as many thousands of small stationary sources without permits, such as residential furnaces. Inventories of SO_2 emissions are relatively complete and accurate, and SO_2 emissions can be readily monitored. Unfortunately, inventories of NO_x emissions are not nearly so complete or reliable, and technology for stack monitoring of NO_x is still in the developmental stage. Historical emissions of NO_x are acknowledged to be very difficult to quantify or verify. The complex nature of the ground-level ozone problem has made evaluation of control strategies difficult (Environment Canada 1992).

Strategy Used by the NO_x/VOC Group

To use its limited time most effectively, the NO_x/VOC Group concentrated on what appeared to be a manageable sector of emissions: NO_x emissions from stationary sources such as petroleum refineries and coal-fired power plants. The Group decided to focus on the potential for NO_x emission trading within this sector, because considerable research was already underway in

this field. Early research by NERA Consultants for the Ontario Ministry of Energy had already indicated a potential for large cost reductions if trading were used to effect NO_x emission reductions in this sector. The Environmental Defense Fund in the U.S. has also supported the use of emission trading, when designed properly and applied to the right pollutants (Goffman 1992).

The NO_x/VOC Group recognized that other economic instruments, such as emission charges or charge-rebate programs, might also be valid and applicable to the ground level ozone problem. Due to limited time, the Group did not have the opportunity to evaluate the advantages or disadvantages of alternative economic instruments.

The NO_x/VOC Group also recognized that the effectiveness of any economic instrument could not be predicted in a vacuum. It would have to be judged within a much larger ozone reduction strategy, taking into account jurisdictional issues, scientific uncertainties, and contributions of both types of precursor pollutants from all sources. The group undertook to draft such a broad conceptual strategy, and sketched out a logical, step-by-step process for identifying which types of emission reductions ought to be undertaken, and by which sectors. The aim of this process, (outlined briefly below and described in greater detail in the Appendix), is to ensure that the most effective reductions are undertaken most quickly, and at a minimal cost to society.

Recommended Strategy for Action on Ground-Level Ozone

1. Set the overall environmental goal

An overall goal for ground-level ozone has already been set in Canada, through the Canadian Council of Ministers of the Environment (CCME 1990). The aim is to attain consistently a one-hour ground-level ozone air quality objective of 82 parts per billion (ppb) by 2005. The Group recognized this goal but did not necessarily endorse it for this study.

2. Establish provincial or regional reduction objectives for NOx and VOCs

The NO_x/VOC Management Plan of the CCME anticipated that provincial governments would determine emission reduction needs for their own airsheds, and commit to those reduction targets through bilateral agreements with the federal government. Thus far, no provinces have signed any such agreements. However, within the jurisdiction of the Greater Vancouver Regional District, a goal of 50 percent reduction of NO_x and VOCs by the year 2000 has been adopted (Greater Vancouver Regional District 1992). Ontario is expected to release an ozone management strategy toward the end of 1993. The report of the NO_x/VOC Group is therefore timely, to ensure that economic instruments and, in particular, trading programs are seriously considered.

The lack of progress on provincial reduction targets is due in part to continuing scientific uncertainty about what types of NO_x and VOC reductions are likely to be most effective in reducing ground-level ozone in a given geographic area (The Bureau of National Affairs 1992). The first two recommendations of the NO_x/VOC Group reflect both the observed need for more detailed research and the need for provincial action.

RECOMMENDATION 1: *Provincial or regional governments should establish NO_x and VOC reduction objectives for specific airsheds through consultation and use of the best available science, detailing the cause/effect relationships between NO_x/VOCs and ground-level ozone.*

3. Identify other detrimental effects of NOx and VOCs

Nitrogen oxides and volatile organic compounds not only are precursors to ground-level ozone, they are air pollutants in their own right, with varying negative impacts on human health and the environment.

RECOMMENDATION 2: *Provincial or regional governments need to evaluate other (non-ozone) detrimental effects of NO_x/VOCs on ambient air quality, and consider these impacts when setting reduction objectives.*

4. Establish accurate emission inventories

Emissions of NO_x and VOCs are produced by diverse activities, ranging from transportation sources, electric power generation, and home heating to the use of solvents, paints, and other surface coatings. Several overview studies have stressed that accurate emission inventories are important for the success of trading programs (Barakat and Chamberlin 1991; CCME 1992). The need for both accurate historical emission inventories and reliable emission monitoring was seen by environmental group representatives on the NO_x/VOC Group as a first important prerequisite of any proposed trading program.

RECOMMENDATION 3: *Provincial or regional governments must develop accurate NO_x and VOC emission inventories for sectors such as mobile sources, large stationary sources, area sources such as home heating, and so on.*

5. Allocate emission reductions among all contributing sectors

The ozone control strategy must deal with all potential sources. Therefore, once reliable emission inventories are available, provinces or regional governments must begin allocating emission reductions among all contributing sectors. The need for a well-designed control strategy, with multi-stakeholder consultation, was identified by environmental group representatives as a second important prerequisite before a specific trading program could be recommended.

RECOMMENDATION 4: *Using environmental and socioeconomic factors, provincial or regional governments, with multi-stakeholder consultation, should allocate emission reductions among all sectors.*

6. Identify the most effective and efficient reduction instruments

Since the cost of a given emission reduction can vary significantly depending on the instrument used, assigning absolute reduction targets among all contributing sectors is certain to be a complex process. The NO_x/VOC Group believes that economic instruments can offer significant improvements to traditional approaches in achieving both environmental protection and economic efficiency. The group focused on permit trading, but recognized that any new approach will need to be vetted against its alternatives. The need for a fair and careful comparison between proposed instruments (e.g., emission trading and emission charges) was considered a third important prerequisite to implementation by environmental group representatives.

RECOMMENDATION 5: *Provincial or regional governments, with multi-stakeholder consultation, should identify and implement the most environmentally and economically appropriate instruments for emission reductions in each sector. The application of economic instruments should be considered for all sectors, since they have the potential to encourage innovation, reward superior performance, and enhance the pace and effectiveness of environmental protection. Further research and discussion of particular economic instruments, such as emission trading programs and emission charges, should be encouraged.*

RECOMMENDATION 6: *In cases where governments are considering trading programs for stationary NO_x emissions, the NO_x/VOC Group recommends that its report and the design criteria therein be considered a guideline in the development of a specific program.*

7. Evaluate progress on a continuous basis

The NO_x/VOC Group saw the need for a continuous evaluation process associated with any provincial or regional NO_x/VOC reduction program. Because ground-level ozone formation is such a complex phenomenon, and because uncontrollable factors

such as meteorology and transboundary pollution are involved, it is quite possible that chronic ozone exceedences may persist in certain localities in spite of ozone reduction successes elsewhere within the program.

RECOMMENDATION 7: *If continuous monitoring of progress discovers chronic problems in a local area, emissions from all sectors need to be re-examined by provincial or regional governments. Improvements should be undertaken in sectors where appropriate instruments have been lacking or have failed to achieve desired results.*

Design Issues Relating to a Potential NO_X Trading Program for Stationary Sources

As described above, the NO_X/VOC Group chose to investigate a trading program for NO_X emissions from stationary sources, partly because trading programs for stationary NO_X are presently under investigation in jurisdictions such as Ontario, and also because recent scientific studies seem to indicate that control of NO_X (as opposed to VOCs) ought to be emphasized (National Research Council 1991). As well, preliminary indications are that large economic efficiency gains are possible under a NO_X trading program. The NO_X/VOC Group recognized that there are many other important sources of NO_X and VOC emissions, particularly in the transportation sectors, which will also require control and which are beginning to be addressed. Progress will be needed on many fronts to ensure that ground-level ozone exceedences become a concern of the past.

The following design features highlight the Group's consensus views and also the outstanding issues regarding a hypothetical trading program for NO_X emissions from permitted stationary sources. Areas where there was no consensus are noted in the text. In each case, a summary of the arguments representing the various points of view can be found in the body of the report. Wherever possible, the NO_X/VOC Group has recommended further work to help resolve these outstanding issues. These recommendations are grouped at the end of this executive summary as "Recommendations for Resolution." The section of text in which further discussion can be found is shown after each recommendation or cluster of recommendations.

SUMMARY OF RECOMMENDATIONS FOR PROGRAM DESIGN

1. Cap Design Recommendations

For design purposes, the NO_x/VOC Group recognized, but did not necessarily endorse, the 82 ppb ozone air quality objective determined by the NO_x/VOC Management Plan (CCME 1990) as part of the framework for the trading program.

The Group offers the following recommendations concerning the setting and management of an emission cap.

The overall NO_x emission reduction goal should:

8.1 reflect the best available scientific determination of the emission reductions necessary to protect environmental and human health in a given airshed; and

8.2 be set in relation to total NO_x emissions from all sectors, not emissions from stationary sources alone.

9. To control emissions from sectors excluded from the trading program, government would commit to implementing appropriate economic instruments and/or regulatory programs, to ensure the overall environmental goal is met.

The NO_x cap for permitted stationary sources in the trading program should:

10. be regionally targeted, reflecting the need to focus abatement efforts geographically;

11. lower overall NO_x emissions from 1993 levels;

12. be set by government, openly and with meaningful input from a multi-stakeholder advisory body;

13. not be increased beyond the original determination, once set; and

14. be allocated initially through a cap "share" distribution. The Group did not reach consensus on the method for the initial allocation.

The cap reduction schedule should:

15. be set on the basis of best available knowledge of ecological and socioeconomic impacts;

16. be legislated by government on the basis of the recommendations from its cap management advisory group; and

17. be geographically targeted for faster and more substantial reductions in the areas where the need is greatest.

18. The reduction schedule adopted in legislation should be assumed to be firm, because certainty surrounding the cap reduction schedule is important for investment confidence and environmental benefit.

19. To provide flexibility in the established schedule, the government should have the ability to influence both the annual level of emissions and the availability (and therefore price) of coupons through management of its own share allocation. Government could only sell to the central marketplace; coupons could not be granted selectively. In extraordinary and unanticipated circumstances (such as significant new scientific findings), a public

revisitation of the cap and cap management process would be required.

Other considerations

20. Although the trading program provides additional economic flexibility, specific employment issues, such as the potential impacts on one-industry towns, require further study.

2. Share and Coupon Allocation

21. The trading program should include all sources of NO_x for which the potential environmental and economic gains of trading outweigh the administrative costs of inclusion in the program.

22. A "share" should represent an allotment of the program cap, and entitle the holder to a defined proportion of the emission coupons distributed quarterly.

23. Program participants would be allocated, by sector, shares of the program cap in proportion to their historical verified emissions and other factors. The Group did not reach consensus on the methodology to be used for the initial allocation.

24. Government would keep and control a small share allocation, allowing it to influence annual coupon prices and emission levels.

25. Each sector should determine internally the formula for division of its allocation, under a set of guidelines established by government to ensure fairness for all of the prospective participants. The Group did not detail or outline how allocations to companies within sectors should occur, if free allocations were to take place.

26. Shares would be distributed by government to existing point sources according to the agreed-upon formula.

27. An appeal mechanism would be required, to which government or the management body could refer appeals of initial share allocation decisions. The NO_x/VOC Group did not reach consensus on whether citizens should have access to this appeal mechanism.

28. A "coupon" would be defined as a permit to emit one tonne of NO_x. Upon emission of one tonne of NO_x, that coupon would be "retired", and no longer valid.

29. Coupons would be distributed annually to program participants in proportion to their share holdings and in accordance with a schedule predetermined to achieve the established environmental goal.

30. The regulator would attach to each coupon issue an administrative fee sufficient to cover regulatory and reporting costs.

31. Further examination of property rights and other legal implications of share and coupon issue should be conducted.

3. Share and Coupon Trading

The following approaches to share and coupon trading should be part of an emission trading system:

32.1 Shares, with the exception of those held by government, would be transferable; that is, they could be sold. Shares held by government could be retired from the market, but not sold.

32.2 Coupons should be transferable (that is, they could be sold), and would be valid until used (that is, they could be "banked" for later use or sale).

32.3 Sales of shares and coupons should be registered with a central regulator. The group did not reach consensus on whether pre-approval of individual trades ought to be required.

32.4 Private corporations as well as non-government groups could purchase coupons from the market. The Group did not reach consensus on whether governments should buy or confiscate coupons from the market.

33. New permitted facilities that will emit NO_x would have to acquire shares and/or coupons as necessary to meet their operating requirements.

34. "Banking" would allow a company to save unused coupons from one period, carry them over and apply them to emissions in a later period, or sell them. While agreeing that restrictions might be required in the event of serious exceedences, the Group did not reach a decision on whether other restrictions should be placed on the ability of a company to bank or cash in coupons.

35. A futures market for coupons may accelerate trading and there would be no reason to preclude it since it would not affect the environmental goal.

36. Any emission source would be able to close down and sell its shares and/or coupons.

37. Government would reserve the right to restrict coupon use in particular areas.

38. Any NO_x trading program would be restricted to Canada. International trading programs should be considered only when all aspects of a Canadian program, including monitoring and enforcement, are working smoothly.

39. Interprovincial trading should be restricted to trades involving shared airsheds.

40. Because summer emissions of ozone precursors are so important, seasonal differentials in the value of coupons might be valuable.

Interpollutant trading was discussed by the Group but members did not investigate its potential. It requires complicated design work and should only be considered if it shows promise in protecting the environment, once NO_x trading has proven successful.

Competition is crucial to the smooth operation of the trading market, and manipulation cannot be tolerated. The Group did not reach consensus on whether existing legislation is adequate to prevent abuses.

4. Performance Requirements

41. Performance specifications will be put into place for each program participant, sufficient to effectively prevent acute, short-term exceedences of emissions.

42. A facility will not exceed these performance specifications, independent of coupon or share holdings.

43. Every tonne of NO_x emitted must be accompanied by retirement of an associated coupon.

44. Government will reserve the right to control emissions, including point sources during peak episodes of ozone (i.e., when ambient ozone levels exceed 82 ppb). It is assumed that governments will evaluate the effectiveness of such control measures.

45. Controlling emissions in peak episodes is distinct from seasonal controls, in that such episodes are short term and unpredictable. While unable to devote time to this issue, the Group recognized that episodes of peak emissions would have to be addressed, and recommends that further research on possible solutions be carried out.

5. Monitoring and Reporting

46. A reliable, verifiable, generally accepted method of measuring and monitoring emissions will be required.

47. The monitoring method must be approved by the regulating authority, and must be used consistently by all program participants.

48. Government audits of the monitoring system should be designed with multi-stakeholder consultation, and implemented randomly, independent of complaints or violations of ambient concentrations.

49. All monitoring data, including calibration data for measurement equipment, should be retained by program participants for a specified time period.

50. The regulating authority should be able to obtain promptly production or other data as required from the proponent or any other government agency to verify reported emissions and compliance with the program.

51. Coupon/share holders should report the tonnes emitted and the status of their coupon and share holdings quarterly.

52. Any change in ownership of shares or coupons should be registered with the appropriate government or administrative agency within a specified period of time. The information provided on the transaction should include the number of shares or coupons transferred and the price at which the transaction occurred. The commercial terms of any specific arrangement should be held confidential.

53. The government reserves the right to make general price information available for program participants as necessary to assist in the functioning of an effective market.

54. Neither brokers nor commodity exchanges should be precluded from involvement in the market.

6. Enforcement

55. If a facility emitted more tonnes than its coupon holdings allowed at the end of any calendar quarter, the facility would be given a limited time period to acquire coupons equivalent to the amount of the imbalance such that its actual emissions are at least equal to its coupon holdings.

56. If an imbalance remains following this time period, a meaningful, effective fine should be imposed.

57. Failure to provide data or falsification of data would be considered a punishable offense.

58. Violation of ambient standards would trigger an investigation and appropriate enforcement response.

Recommendations for Resolution where the Group did not reach consensus

To resolve recommendation 14: Governments and other interested bodies should evaluate the initial share allocation methods used by emission trading programs in effect in the U.S., ranging from free distribution to full auctioning.

To resolve recommendation 25: Governments and other interested bodies should develop draft guidelines by which an industry sector might distribute NOx allocations among its members.

To resolve recommendation 27: Governments and other interested bodies should investigate the role and need for citizens' access to an appeal of the share allocation process, and also whether alternative mechanisms can offer citizens an effective voice when the distribution of shares becomes controversial for geographic or other reasons.

To resolve recommendation 32.3: The experience with pre-approvals should be examined further, with a view to identifying whether pre-approvals are a useful or necessary component of the trading system.

To resolve recommendation 32.4-1: Further studies are needed to investigate trading designs, which could provide market players with the necessary confidence to trade and bank coupons, while still retaining the capacity of government to regulate the market in the public interest when necessary.

To resolve recommendation 32.4-2: Governments and other interested bodies should investigate the feasibility and probable environmental impacts of the purchase of emission coupons by citizens' groups and/or charities.

To resolve recommendation 34: Further studies are needed to identify design features that would allow banking to occur without resulting in short-term ozone exceedences.

On the matter of trading and competition discussed in section 3.9: Governments and other interested bodies should be aware of the necessity of ensuring good competition, and anticipate and work to prevent potential market breakdowns for any situation.

GLOSSARY

Throughout this report, the following terms apply.

Cap: A ceiling or finite regulatory limit established in law to hold the sum of all emissions of facilities involved in trading to a specified level. In the case of NO_x, that ceiling would require reductions from existing emission levels.

Environment: The natural world, including its human inhabitants.

Annual Emission Limit: The scheduled annual emission levels required to achieve the cap goal over time.

Share: An allotment of the program cap, and entitling holders to a defined proportion of the emission coupons distributed quarterly. Shares, with the exception of those held by government, are transferable — they can be sold.

Coupon: A permit to emit one tonne of NO_x. Upon emission of one tonne, that coupon is "retired", and no longer holds value. A coupon is transferable, that is, it can be sold; and it is valid until used, that is, it can be "banked" for later use or sale.

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- Linton Kulak, who chaired the Group; and
- Ellen Schwartzel, who prepared this report.

CHAPTER 1
CAP SETTING AND MANAGEMENT

1.1 Setting the Cap

For design purposes, the NO_x/VOC Group recognized, but did not necessarily endorse as part of the framework for the trading program, the 82-ppb ozone air quality objective in the NO_x/VOC Management Plan of the Canadian Council of Ministers of the Environment. A well-designed, effective trading program should be able to achieve a given goal at lower cost and with less delay than more traditional regulatory approaches. Alternatively, a good trading program should be able to achieve lower overall emission levels for a given level of expenditure.

RECOMMENDATION 8.1: *The overall NO_x emission reduction goal should reflect the best available scientific determination of the emission reductions necessary to protect environmental and human health in a given airshed.*

RECOMMENDATION 8.2: *The overall NO_x emission reduction goal should be set in relation to total NO_x emissions from all sectors, not emissions from stationary sources alone.*

RECOMMENDATION 9: *To control emissions from sectors excluded from the trading program, government would commit to implementing appropriate economic instruments and/or regulatory programs to ensure that the overall environmental goal is met.*

RECOMMENDATION 10: *The NO_x cap for permitted stationary sources should be regionally targeted, reflecting the need to focus abatement efforts geographically, on the regions for which ground-level ozone is the greatest problem. For example, it might prove necessary to create a special cap for local airsheds with chronic ozone problems, such as Toronto.*

RECOMMENDATION 11: *The cap should lower overall NO_x emissions from 1993 levels.*

RECOMMENDATION 12: *The cap should be set by government, openly and with meaningful input from a multi-stakeholder advisory body.*

The cap should involve broad consultation. This does not imply any abrogation of government's authority or responsibility, but does give government the opportunity to hear the views of stakeholders and to reflect them in the final product. This is proactive rather than reactive, and opens the decision-making process to the public. The advisory group's proposed membership and function is described in section 1.2.

RECOMMENDATION 13: *The cap should not be increased beyond the original determination, once set.*

Businesses will have made pollution control investments in good faith and with the expectation that their value could only stay constant or appreciate. Raising the cap, the equivalent of printing "environmental currency", would cause coupon inflation. The certainty of the cap is crucial to investment confidence and smooth operation of the market. Keeping the cap firm also precludes revisiting the "jobs or environment" debate. Changing the cap because of economic dislocation would work too slowly to be of any help anyway (NERA 1990). Were socioeconomic considerations to warrant a reconsideration of the original environmental goal and cap management schedule, it should be the schedule that is altered, not the cap; however, it should be noted that

elongating the schedule would also reduce the value of held coupons.

RECOMMENDATION 14: *Shares of the cap should be allocated initially through a cap "share" distribution.*

The Group did not reach consensus on the method for the initial allocation. Industry representatives held the position that the initial shares should be distributed free of charge on the basis that the additional costs of an auction would represent monies that could otherwise be spent by companies for environmental protection. Revenues collected by government through an auction would represent no environmental gain unless targeted for that purpose. They further emphasized that costs have already been incurred to meet regulatory requirements, and pointed out that auctions may preclude the opportunity to reward previous improvements.

Environmental group representatives favoured an initial allocation through auction or limited auction of shares. Auction funds, they argued, would provide compensation to society for rent of its resources, as well as potentially providing funds for government's ambient monitoring costs. If an auction were adopted as the allocation option, it would be possible to earmark the revenues for environmental purposes, and make the auction revenue-neutral. An auction might also make entry to the market easier for new, cleaner facilities in the year in which the share allocation is made.

RECOMMENDATION FOR RESOLUTION: *Governments and other interested bodies should evaluate the initial share allocation methods used by emission trading programs in effect in the U.S., ranging from free distribution to full auctioning.*

1.2 Cap Management Plan

RECOMMENDATION 15: *The cap reduction schedule should be set on the basis of best available knowledge of ecological and socioeconomic impacts.*

A reduction of 100,000 tonnes from existing levels, for example, could be achieved in two 50,000-tonne cuts over six years, or four 25,000-tonne cuts over 12 years. The schedule should specify the outside date for achievement of the environmental goal.

RECOMMENDATION 16: *Government should legislate the management schedule on the basis of the recommendations from its cap management advisory group.*

The cap management advisory group's first function would be to advise government on the level of the cap and the cap management schedule. It might refer appeals of share allocation decisions to the designated regulator (as recommended in section 2.2), and might identify to government the need for revisitation of the cap management schedule, noted below.

The membership principle should be that the group represent society's interests very broadly, and not have specific self-interest. Individual companies would not be represented. Consequently, membership in the cap management advisory group would consist of "society's shareholders": environmental groups; consumer groups; government ministries representing development, economics, environment, and public health; labour groups; chambers of commerce; and other industry associations.

The second function of the advisory group would be to advise government on management of the government share allocation. Industry would manage its own shares to influence the market, and the management body and government would manage society's allocation.

RECOMMENDATION 17: *The cap reduction schedule should be geographically targeted for faster and more substantial reductions in the areas where the need is greatest.*

RECOMMENDATION 18: *The reduction schedule adopted in legislation should be assumed to be firm, because certainty surrounding the cap reduction schedule is important for investment confidence and environmental benefit.*

RECOMMENDATION 19: *To provide flexibility in the established schedule, the government should have the ability to influence both the annual level of emissions and the availability (and therefore price) of coupons through management of its share allocation. Government could only sell to the central marketplace: coupons could not be granted selectively.*

The appointed, multi-stakeholder cap management advisory group would counsel the government on its coupon allocation in a given year. Were new entrants experiencing difficulty gaining access to coupons, the advisory group might recommend that government's coupon allocation be sold to the market that year (there might be a test applied to this decision — perhaps coupon price relative to marginal cost of control). If the reduction transition was more difficult than anticipated by the legislated reduction schedule, the management body might advise government to sell its allocation for that year, lowering coupon price and thereby slowing the abatement investment schedule.

Should environmental circumstances arise that warrant emission reductions beyond those scheduled, the management group might advise that government's allocation be retired. Alternatively, government could "bank" its coupons, guaranteeing fewer emissions for that year, but keeping open the possibility of coupon release in later years, if environmental circumstances permitted or market conditions warranted.

In extraordinary and unanticipated circumstances (such as significant new scientific findings), a public revisitation of the cap and cap management process would be required.

1.3 Other Considerations

RECOMMENDATION 20: *Although the trading program provides additional economic flexibility, specific employment issues, such as the potential impacts on one-industry towns, require further study.*

To the extent that emission trading increases the capital efficiency of environmental protection, additional societal resources are available for development, jobs, and achievement of other societal goals. For example, it is estimated that had the U.S. relied on "command and control" regulation rather than emission trading to meet its SO_2 emission reductions, 145,000 person years of manufacturing employment would have been lost by 2005 (Dudek and LeBlanc 1992). On the other hand, there is no guarantee that these financial savings would translate into Canadian jobs.

The following questions require additional study and consideration:

- What will be the employment impact of the program on one-industry towns and other areas, where standards may be relaxed due to employment considerations? Even if there is overall job gain from emission trading, could the threat of site-specific losses prevent adoption of emission trading?
- Are there specific industries and/or labour groups that could be particularly affected by emission trading?

1.4 Conclusion

In conclusion, trading offers additional flexibility to both government and industry through proper setting of the cap and management of the reduction schedule. The potential for capital efficiency, operating flexibility, and lower cost are attractive features. Whether emission trading will particularly affect specific industries, regions, or groups of people has yet to be determined.

CHAPTER 2
SHARE AND COUPON ALLOCATION

2.1 Determination of Program Participants

RECOMMENDATION 21: *The trading program should include all sources of NO_x for which the potential environmental and economic gains of trading outweigh the administrative costs of inclusion in the program. Under the proposed design, stationary NO_x sources currently operating under provincial permits would be included in the program.*

Theoretically, the greater the number of sources included, the greater the opportunity for cost efficiency and cost-levelling between sectors. However, some programs will be much more difficult to establish and run; stationary NO_x will be easy compared to NO_x and VOCs from the transportation sector, for example.

Different sectors of point sources could be phased into the program if net environmental and economic advantages of trading are documented. In any case, it is assumed that comparable emission reductions will be required in the non-participant sectors. As traditional regulatory efforts are heightened and as the cost-saving results of emission trading begin to surface, those sectors excluded from emission trading may well lobby for inclusion in the program. Entry of a new sector should not be facilitated by devaluation or confiscation of existing participants' shares or coupons. Instead, entry of a new sector would imply a new cap and new shares appropriate for that sector. To allow trading between sectors, the two caps would have to be added.

At this time, the Group recommends that small stationary sources of NO_x not be included in the program, consistent with NERA's recommendation, on the basis that, due to size and volume (only 20 percent of NO_x in Ontario is from this sector), this sector likely represents limited opportunities. The expectation is that economic instruments or other regulatory measures will effect appropriate reductions from these sectors.

2.2 Allocation of Shares

RECOMMENDATION 22: *A "share" should represent an allotment of the program cap, and entitle the holder to a defined proportion of the emission coupons distributed quarterly.*

RECOMMENDATION 23: *Program participants would be allocated, by sector, shares of the program cap in proportion to their historical verified emissions and other factors.*

The Group did not reach consensus on the methodology to be used for the initial allocation.

If shares were to be distributed without an auction, shares would be allocated in proportion to historical emissions over a certain period (three to five years, for example), with the count predating announcement of the share allocation. Industry representatives were interested in formal recognition and compensation for previous voluntary reductions in NO_x emissions. Environmental group representatives, however, were concerned that historical emissions data for stationary NO_x emissions are inadequate, and that the technology for on-line monitoring of NO_x is still

in developmental stages. The NERA study outlines the need for an accurate inventory, and the problems with the current inventory base (NERA 1992). An accurate inventory base is seen by environmental representatives as a necessary prerequisite, both for establishing an appropriate overall cap, and for determining allocations to sectors.

Following are broad sectoral historic emission estimates for 1985. They might reflect the shape of the initial share allocation, if done federally. But for environmental control, these allocations would be made more appropriately on a regional basis.

Table 1. NO_x Emissions in Canada, 1985

Source	*% of total emissions*
Mobile sources:	
cars	17.0
light-duty trucks	7.0
other transportation	38.5
Power generation	13.1
Natural gas industry	8.4
Industrial/commercial fuel combustion	7.7
Industrial processes	4.7
Other	3.5
TOTAL (rounded)	100

Source: *CCME 1990.*

RECOMMENDATION 24: *Government would keep and control a small share allocation, allowing it to influence annual coupon prices and emission levels.*

Some of the applications of this management ability are outlined in section 1.2. The government allocation could be taken out of industry's existing ability to emit NO_x; government's allocation should by no means be facilitated by increasing the overall cap. The U.S. Government share holding for SO_2 shares was three percent.

RECOMMENDATION 25: *Each sector should determine internally the formula for division of its allocation, under a set of guidelines established by government to ensure fairness for all of the prospective participants.*

Industry sectors would then determine their allocation formulas in accordance with these guidelines. However, the NO_x/VOC Group did not detail or outline how allocations to companies within sectors should occur, if free allocations were to take place.

In some sectors, emitters at the extreme ends of the spectrum might not be dealt with fairly by an historical-average allocation; for example, the cleanest companies, having made pollution control investments ahead of their time, would, in effect, be penalized by being under-allocated compared with their competitors. The dirtiest companies would receive a very large allocation and could profit by making the same retrofits made by their clean and unrewarded competitors years earlier. Some emitters could, in anticipation of the share allocation, boost their emissions to increase their historical average and therefore the size of their allocation, in order to profit from coupon sales. This could be prevented by counting several years backward from the date of announcement of the trading system, as long as accurate inventories were available.

An allocation based on a standard might also be possible; those few that don't meet the standard would be assigned coupons only on the basis of that allowable emission limit. This could prevent the inadvertent rewarding of companies that were slow to adopt pollution control technologies.

This fear of condoning outmoded and polluting point sources through share allocation — in effect, grandfathering with a potential property right — is often cited as a very basic problem with trading. Proponents of intra-sector allocation by industry stakeholders hold that industry will regulate its competitors far better than any government could.

Facilities facing retirement with or without a trading program would be motivated to acquire a share allocation anyway, since it could be sold once the facility is closed. Under an industry-run allocation, this would be policed by competitors at the time of initial share allocation, since firms have a vested interest in ensuring that their competitors don't profit unfairly from a closure.

RECOMMENDATION FOR RESOLUTION: *The Group recommends that governments and other interested bodies develop draft guidelines by which an industry sector might distribute NOx allocations among its members.*

RECOMMENDATION 26: *Shares would be distributed by government to existing point sources according to the agreed-upon formula and/or guidelines.*

RECOMMENDATION 27: *An appeal mechanism would be required, to which government or the management body could refer appeals of initial share allocation decisions.*

The Group did not reach consensus on whether citizens should have access to this appeal mechanism.

The Energy Resources Conservation Board in Alberta now fulfils a similar function in the area of pipeline pro-rationing. There would have to be a statute of limitations on such appeals.

Industry representatives were concerned about the additional costs of broadening such appeal processes. They suggested that concerns about local air quality impacts would be better addressed through other mechanisms: either early in the cap-setting process, or by improving the ability of ambient air quality objectives to prevent local exceedences. Environmental group representatives, however, were of the view that an overall cap would not address the possibility of geographic clustering of emission sources.

Effective, enforceable ambient air quality objectives are an attractive concept, but are likely to be a long-term, rather than a short-term solution. The right to comment on and appeal licences or permits that may have significant local environmental impacts is considered very important by the environmental community. A form of screening to prevent frivolous appeals would be a component of such a process. A similar design is an integral part of Ontario's proposed Environmental Bill of Rights.

RECOMMENDATION FOR RESOLUTION: *Governments and other interested bodies should investigate the role and need for citizens' access to an appeal of the share allocation process, and also whether alternative mechanisms can offer citizens an effective voice when the distribution of shares becomes controversial for geographic or other reasons.*

2.3 Allocation of Coupons

RECOMMENDATION 28: *A "coupon" would be defined as a permit to emit one tonne of NO_x. Upon emission of one tonne of NO_x, that coupon would be "retired", and no longer valid.*

RECOMMENDATION 29: *Coupons would be distributed annually to program participants in proportion to their share holdings and according to the schedule predetermined to achieve the established environmental goal.*

For example, if a cap reduction schedule were in place, participants would know that in the first year of the program one share entitles the holder to one coupon; but in the fifth year, it would entitle the holder to 0.85 coupon; and in the tenth year, 0.75 coupon. Regulators would effect such a change in coupon value by altering the share dividend rate according to the established emission reduction schedule.

RECOMMENDATION 30: *The regulator would attach to each coupon issue an administrative fee sufficient to cover regulatory and reporting costs.*

This fee could also be used to cover some of the ambient monitoring costs, in proportion to the NO_x emissions contributed by the affected sectors.

RECOMMENDATION 31: *Further examination of property rights and other legal implications of share and coupon issue should be conducted.*

In the U.S., neither shares nor coupons represent any more of a legal right to emit than point sources presently hold. There has been a recent U.S. court decision stating that a coupon was not a property right. This clarification was written into the U.S. legislation because this would become an issue if the trading program fell apart and the government was being pressured to compensate industry. A Canadian legal opinion would be helpful.

CHAPTER 3
SHARE AND COUPON TRADING

3.1 Buying and Selling Shares and Coupons

The following approaches to share and coupon trading should be part of an emission trading program.

RECOMMENDATION 32.1: *Shares, with the exception of those held by government, would be transferable; that is, they could be sold. Shares held by government could be retired from the market, but not sold.*

RECOMMENDATION 32.2: *Coupons should be transferable (that is, they could be sold), and would be valid until used (that is, they could be "banked" for later use or sale). See section 3.3 for a further discussion of banking.*

A point source could use its allocated coupons to offset emissions, reducing emissions in step with a legislated reduction schedule, if necessary. Alternatively, emissions could be reduced in advance of the legislated schedule, or in volumes greater than those required, thus freeing coupons for sale to other point sources. Purchase of coupons would be attractive to an individual point source or firm if the coupon price were less than the cost of the upcoming requirement for emission reduction.

Coupon sale and purchase ensures that abatement investments are made on a least-cost basis, while meeting the overall environmental goal. In a scenario requiring remedial action and, therefore, scheduled cap reductions, many trades would be expected. Even a small number of trades would involve significant dollar values and potential economic efficiency gains.

RECOMMENDATION 32.3: *Sales of shares and coupons should be registered with a central regulator.*

The group did not reach consensus on whether pre-approval of individual trades ought to be required.

Industry representatives preferred registry of trades after the fact. They were concerned that pre-approval would become overly bureaucratic and inhibit trading, thus reducing the overall economic efficiency of the program. For example, they cited cumbersome trading rules in the early American emission trading programs in which firms were trading only for "big prizes", since the smaller gains were outweighed by the administrative burden of the trading rules, including a pre-approval requirement that took up to six months (NERA 1991).

On the other hand, environmental group representatives saw pre-approval as an important environmental safeguard for a program that is new and as yet untried in Canada. The fact that pre-approval is a component of the most active trading program in the United States — the South Coast Air Quality Management District — was, in their view, evidence that pre-approval could work (Barakat and Chamberlin 1991).

RECOMMENDATION FOR RESOLUTION: *The experience with pre-approvals should be examined further, with a view to identifying whether pre-approvals are a useful or necessary component of the trading system.*

RECOMMENDATION 32.4: *Private corporations as well as non-government groups could purchase coupons from the market.*

The Group did not reach consensus on whether governments should buy or confiscate coupons from the market.

Environmental group representatives did not believe that government should act as just another player in the market. In their view, government should act as an overseeing regulator, and should retain the right to confiscate coupons if environmental conditions make this a necessity. Further, governments should not be forced to buy back rights to a public good that had been freely distributed. They argued that government confiscation of coupons would represent the only available fast-track process to deal with unforeseen emergencies, since acceleration of the cap management schedule would take a number of years to be effective.

In contrast, industry representatives did not think that governments should be permitted to either buy or confiscate coupons from the market. They were concerned that governments, whose fiscal restraints would be different from those of any other market participant, would buy large numbers of coupons regardless of the price, because they were accountable to taxpayers only at election time. Industry representatives were also very concerned that the possibility of coupon confiscation would destroy market confidence in trading and banking of coupons. They thought that government should use its own share allocation of the cap to address unforeseen environmental conditions.

Environmental group representatives were concerned that an unrealistic level of environmental benefit might be expected from charitable purchases of emission coupons. They expected that individual coupons would be too expensive to make a "buy clean air" campaign by charities very effective.

There was agreement in the Group about the potential advantages of the buying and selling of coupons by third party private corporations. For example, stockbrokers and commodity exchanges would be able to offer futures markets and facilitate sales.

Banked coupons might be held informally by firms planning to use them later in the reduction schedule or in a facility expansion. Banked coupons offered for sale might be formally registered on commodity exchanges and with regulators; any broker would know where to find them.

RECOMMENDATIONS FOR RESOLUTION :

Further studies are needed to investigate trading designs, which could provide market players with the necessary confidence to trade and bank coupons, while still retaining the capacity of government to regulate the market in the public interest when necessary.

Governments and other interested bodies should investigate the feasibility and probable environmental impacts of the purchase of emission coupons by citizens' groups and/or charities.

3.2 New Entrants to the Market

RECOMMENDATION 33: *New permitted facilities that will emit NO_x would have to acquire shares and/or coupons as necessary to meet their operating requirements.*

Whereas existing emitters had a reasonable expectation that they wouldn't have to pay for the use of the resource, new entrants will have to pay for the privilege of emitting. Most historic participants should be able to reduce their emissions well below their allowance levels, thereby creating more "headroom" for the construction of new facilities. Plant retirements and decreasing utilization of existing point sources over

time should also liberate emission allowances for use by new entrants.

3.3 Banking

RECOMMENDATION 34: *"Banking" would allow a company to save unused coupons from one period, carry them over and apply them to emissions in a later period, or sell them.*

This would provide companies with important flexibility. While agreeing that restrictions might be required in the event of serious exceedences, the Group did not reach a decision on whether other restrictions should be placed on the ability of a company to bank or cash in coupons.

Environmental group representatives were concerned that banking of coupons during periods of economic recession might result in large accumulations of NO_x emissions that could be emitted legally during periods of rapid economic growth. Without adequate safeguards, this could result in environmentally damaging episodes of high ozone, even within a declining cap program. Short-term ozone episodes and their impacts on human health and the environment are the major problems associated with ground-level ozone. This concern would be much less important in the case of SO_2, where long-term cumulative loading to water and soil is the problem. Banking would likely be even less of a problem with greenhouse gases, since their impact is associated with global cumulative loadings.

Environmental group representatives recommended that rules be attached to the use of banked coupons; for example, restricting the timing and location of their use and requiring pre-approval prior to their use. Establishing hourly emission limits might be another mechanism to employ. It might also be possible to set an annual cap on the number of banked coupons that can be used in particular areas, or to use ambient ozone levels as a trigger to temporarily prevent the use of banked coupons.

Industry representatives, on the other hand, saw banking as a critical component of an effective trading program, providing important flexibility in adjusting to business cycles, and creating incentives to reduce emissions and sell excess coupons. They were concerned about any restrictions being placed on banking. In their view, restrictions on use could discourage banking, thereby preventing the environmental benefits that would have resulted from firms advancing their control schedules (CCME 1992:42-44).

At the extreme end is confiscation of banked coupons. In the U.S., some firms feared that if they identified banked reductions, regulators would tighten standards to eliminate them; in 1990, a California regulator decided to devalue banked permits from shutdown plants by 80 percent (NERA 1991:40).

Industry representatives emphasized the important benefits of banking, including maintaining stability in the price of coupons, providing flexibility for pronounced business cycles, and accelerating emission reductions through voluntary action. For example, allowing banking in the U.S. lead-in-gasoline trading program forced reductions earlier than would have been the case otherwise. Because a lead permit was less valuable prior to the scheduled reduction than it would become after the more stringent 0.1 gram-per-gallon standard came into effect, lead emitters made emission reductions earlier than required and banked their unspent allowances for later use or sale. Banking allowed refiners to smooth implementation of the standard. It saved US $225M, or 20 percent of the cost to refiners of the phase-down rule (NERA 1991).

RECOMMENDATION FOR RESOLUTION: *Further studies are needed to identify design features that would allow banking to occur without resulting in short-term ozone exceedences.*

3.4 Futures Markets

RECOMMENDATION 35: *A futures market for coupons may accelerate trading and there would be no reason to preclude it since it would not affect the environmental goal.*

Introduction of this service will result from the desires and requirements of program participants; government does not have to design this into the trading program.

Futures markets, or hedging, allow investors to lock into a future price for a commodity, thus reducing investment risk. In the case of the NO_x share and coupon market, program participants, having decided to invest in either emission control or shares and coupons, are exposed to the risk that the price of shares and coupons will rise or fall in a manner that was unanticipated. A futures market eliminates that risk. This is a service that the Chicago Board of Trade has offered to buyers and sellers of SO_2 emission allowances (Major 1992). This same process of buyers and sellers coming together in a centralized marketplace to bid and barter also results in price discovery.

3.5 Retiring Stations

RECOMMENDATION 36: *Any emission source would be able to close down and sell shares and/or coupons.*

This incentive would have environmental benefit, given that some outdated point sources are not being retired. It is assumed that under appropriate allocation guidelines, plants that were already scheduled to close down would not receive shares. Environmental group representatives thought a time limit should be placed on the holding of shares by emitters who have shut down their facilities.

Society should give the right signals to owners and operators of older, dirtier plants. Currently, these facilities may be treated favourably by traditional regulatory regimes, usually involving case-by-case negotiation of permit updates, where they take place. This has the effect of encouraging prolonged operation of older facilities because a newer replacement facility might incur an economic premium for compliance with more stringent "new source performance standards."

The ability to sell coupons and shares can change the economic signals provided to owners of older facilities. Older facilities would be shut down sooner than they might otherwise be. For a strong economy and healthy environment, this is a direction that should be facilitated rather than hindered, as it is now. Also, the capital generated could facilitate transition to newer technology, site clean-up, or investment in other sectors.

To minimize concerns with retiring stations, it will be important to set the overall cap appropriately, based on ecological criteria alone. It will also be important to have episodic controls.

3.6 Geographic Boundaries and Trading Restrictions

RECOMMENDATION 37: *Government would reserve the right to restrict coupon use in particular areas.*

Trading programs can be designed to influence the timing and location of emissions to address local ambient concerns. In such cases, increased resources will be required to monitor emissions and track trades, and some market opportunities will be lost due to subdivision of the market.

Design options include:

- establishing small trading zones and limiting trading across their boundaries. (It should be noted that a narrow definition of trading zones reduces the potential for trades by limiting the number of potential traders, thus reducing the potential environmental benefits and economic savings.)

- using different exchange rates on coupons, depending on location, to encourage required behaviours. For example, sources in the western part of the Windsor/Quebec corridor might need to submit more than one coupon per tonne emitted, because of relatively high ozone concentrations. Sources east of Toronto might be allowed to submit less than one coupon per tonne of emissions.

RECOMMENDATION 38: *Any NO_x trading program would be restricted to Canada. International trading programs should be considered only when all aspects of a Canadian program, including monitoring and enforcement, are working smoothly.*

Since much of the ozone problem in Ontario originates in the U.S., anything that can be done to hasten U.S. emission reduction will benefit the Canadian environment. However, monitoring and enforcement of an international trading program would be complicated, and discussion at this stage seems premature.

RECOMMENDATION 39: *Interprovincial trading should be restricted to trades involving shared airsheds.*

3.7 Seasonal Rules

RECOMMENDATION 40: *Because summer emissions of ozone precursors are so important, seasonal differentials in the value of coupons might be valuable.*

More stringent controls in the summer can be encouraged by making the exchange rate between coupons and emissions vary with the time of year. More coupons per tonne of emissions would be required in the summer than in the winter. NERA (1992) suggests, for example, that 1.25 coupons might be required to emit a tonne of NO_x in summer, and 0.75 coupons in the winter.

This would direct controls towards those sources that operate more heavily in the summer (such as asphalt plants) and away from those used primarily in the winter (such as electricity boilers used for space heating). It should also influence the use of point sources; for example, Ontario Hydro might schedule maintenance of its high-emission coal plants in the summer, and its other plants in the spring and fall.

The CCME discussion paper on emission trading (1992) notes that if only a small percentage of all emitting sources were to be included in the program, seasonal rules might not be worth the additional complexity.

3.8 Interpollutant Trading

The NO_x/VOC Working Group did not investigate the potential for interpollutant trading. Interpollutant trading requires complicated design work, and should only be considered if it showed promise in protecting the environment. Certainly, the current incomplete level of knowledge of how NO_x and VOCs interact in specific circumstances makes a discussion of trading between these two types of pollutants difficult (Government of Canada 1992).

3.9 Trading and Competition

Competition is crucial to the smooth operation of the trading market, and manipulation cannot be tolerated. The NO_x/VOC Group did not reach consensus on whether existing legislation would be adequate to prevent abuses.

Information availability, or transparency, is important to ensure effective operation of the market and to prevent monopolies. Reduced trading may be a signal that increased transparency is needed. Market forces, by their nature, will lead to the emergence of brokers and exchanges, which would be able to fill some transparency requirements. Government would not have to assume a role in establishing this

capability, but would have to monitor program effectiveness and be prepared to address any market weaknesses if this becomes necessary.

The anti-competitive rules of the mercantile exchanges, the Anti-Combines Act, and the Federal Bureau of Competition may be strong enough and effective enough to curb potential abuses. Environmental group representatives suggest that more evidence to support this stand would be helpful.

RECOMMENDATION FOR RESOLUTION:
Governments and other interested bodies should be aware of the necessity of ensuring good competition, and anticipate and work to prevent potential market breakdowns for any situation.

CHAPTER 4
PERFORMANCE REQUIREMENTS

RECOMMENDATION 41: *Performance specifications will be put into place for each program participant, sufficient to effectively prevent acute, short-term exceedences of emissions.*

RECOMMENDATION 42: *A facility will not exceed these performance specifications, independent of coupon or share holdings.*

RECOMMENDATION 43: *Every tonne of NO_x emitted must be accompanied by retirement of an associated coupon.*

RECOMMENDATION 44: *Government will reserve the right to control emissions, including point sources, during peak ozone episodes (that is, when ambient ozone levels exceed 82 ppb.). It is assumed that governments will evaluate the effectiveness of such control measures.*

RECOMMENDATION 45: *Controlling emissions in peak episodes is distinct from seasonal controls, in that such episodes are short-term and unpredictable. While unable to devote time to this issue, the Group recognized that episodes of peak emissions would have to be addressed, and recommends that further research on possible solutions be carried out.*

CHAPTER 5
MONITORING AND REPORTING

RECOMMENDATION 46: *A reliable, verifiable, generally-accepted method of measuring and monitoring emissions will be required.*

RECOMMENDATION 47: *The monitoring method must be approved by the regulating authority, and must be used consistently by all program participants.*

RECOMMENDATION 48: *Government audits of the monitoring system should be designed with multi-stakeholder consultation, and implemented randomly, independent of complaints or violations of ambient concentrations.*

RECOMMENDATION 49: *All monitoring data, including calibration data for measurement equipment, should be retained by program participants for a specified time period.*

RECOMMENDATION 50: *The regulating authority should be able to promptly obtain production or other data, as required, from the proponent or any other government agency, to verify reported emissions and compliance with the program.*

RECOMMENDATION 51: *Coupon/share holders should report the tonnes emitted and the status of their coupon and share holdings quarterly.*

RECOMMENDATION 52: *Any change in ownership of shares or coupons should be registered with the appropriate government or administrative agency within a specified period of time. The information provided on the transaction should include the number of shares or coupons transferred and the price at which the transaction occurred. The commercial terms of any specific arrangement should be held confidential.*

RECOMMENDATION 53: *The government reserves the right to make general price information available for program participants as necessary to assist in the functioning of an effective market.*

RECOMMENDATION 54: *Neither brokers nor commodity exchanges should be precluded from involvement in the market.*

CHAPTER 6
ENFORCEMENT

RECOMMENDATION 55: *If a facility emitted more tonnes than its coupon holdings allowed at the end of any calendar quarter, the facility would be given a limited time period to acquire coupons equivalent to the amount of the imbalance such that its actual emissions are at least equal to its coupon holdings.*

RECOMMENDATION 56: *If an imbalance remains following this time period, a meaningful, effective fine should be imposed.*

RECOMMENDATION 57: *Failure to provide data or data falsification would be considered a punishable offence.*

RECOMMENDATION 58: *Violation of ambient standards would trigger an investigation and appropriate enforcement response.*

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THE ECONOMIC INSTRUMENTS COLLABORATIVE REPORT

LIMITING GREENHOUSE GAS EMISSIONS

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LIMITING GREENHOUSE GAS EMISSIONS

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EXECUTIVE SUMMARY

This report presents recommendations concerning the choice of the most appropriate economic instrument for addressing the issue of Canadian greenhouse gas (GHG) emissions, and the context in which such an instrument might be applied. It represents the consensus position developed by the Climate Change Group of the Economic Instruments Collaborative, a group of individuals from environmental organizations, industries and the National Round Table on the Environment and the Economy, who came together to carry out this task. Government observers were present throughout the process. The members of the Climate Change Group are conscious of the concerns that exist with respect to greenhouse gases. These concerns will generate some responses in terms of policies and actions. The approach and recommendations of this report with respect to economic instruments are offered as a framework and pathway for policy and action that is, in the shared view of the group, superior to responses that might otherwise be adopted.

The Climate Change Group approached its work with the dual objectives of meeting both environmental and economic interests. While the task of detailed design of an economic instrument for managing Canada's greenhouse gas emissions is not completed, an encouraging degree of consensus has been achieved on many of the conceptual issues. The report identifies several areas where further work must be done. Recommendations are made as to the kind of instrument that Canada could adopt to meet both environmental and competitiveness concerns, and the process and framework that should be followed in its adoption.

This report was researched and authored based on the guiding principles which are supported by the entire Economic Instruments Collaborative.

Despite considerable uncertainty in the scientific community about the long-term effects of increased levels of greenhouse gases, and uncertainty also about the social, economic, and environmental impacts of various possible strategies for reducing these emissions, the need for certain prudent, precautionary measures in the next decade is widely accepted. Debate continues, however, about the degree and urgency of action.

The Climate Change Group believes that, within the context of a broad Canadian strategy for addressing greenhouse gas emissions, there is potential for economic instruments to play an important role in encouraging cost-efficient action. Without agreeing on the appropriateness of the commitment, the Group has accepted, as an initial goal for the purpose of this exercise, Canada's undertaking to stabilize net greenhouse gas emissions at 1990 levels by the year 2000. The need to revisit this goal as new information becomes available is stressed by the Group. The setting of environmental goals, the design of the economic instrument to achieve them, and the monitoring of progress toward them will all reflect the changing elements of uncertainty which now characterize the climate change problem, and will continue to do so for some time to come.

A number of contextual issues shape the framework in which economic instruments could be applied. The instruments should be seen as part of an overall strategy, which would include:

- the examination and where appropriate, the removal of subsidies;
- the removal, where possible, of barriers that currently prevent so-called "no-regrets" measures[1] from achieving their potential; and
- an ongoing role for regulatory mechanisms.

Voluntary investments (above and beyond "no-regrets" measures) in projects designed to reduce net emissions, either in Canada or abroad, should be encouraged by establishing a process for registration of such measures (actions for credit). If and when an economic instrument is implemented, previously registered, qualified, voluntary actions would be able to earn credit against the financial burden imposed by the instrument.

Climate change cannot be considered in isolation from the other environmental impacts associated with economic activity. The need to develop temporary measures to prevent the substitution of one kind of environmental impact for another is identified.

The Climate Change Group briefly reviewed a number of economic instruments that might be appropriate, before agreeing to focus on broadly based instruments capable of sending price signals through the entire economy — instruments that will encourage both a change in consumer behaviour as well as innovation by both users and producers. Alternative instruments include charges on emissions, and/or tradable permits that impose a fixed cap on emissions within a given area; either could be applied at the level of the producer/importer or consumer/emitter.

Major design considerations influencing the choice among options include:

- the need to avoid damaging the competitiveness of Canadian industry;
- concerns about disparity of impact on different sectors and regions of Canada; and
- the need to provide flexibility for adaptation as knowledge and experience are gained.

All Group members see international offsets (allowing credit for greenhouse gas emission reductions or for carbon dioxide sequestering outside of Canada) as a valuable and cost-effective supplement to in-Canada actions. Consensus has not been reached about the extent to which overseas actions should be accepted as a substitute for domestic reduction of emissions in achieving the stabilization goal.

A number of gases contribute to the greenhouse effect. The Group agreed that economic instruments which covered a broad range of greenhouse gases are appropriate for cost effective achievement of Canada's goals. This led to the development of a hybrid instrument that relates specifically to carbon dioxide through a charge mechanism and, more broadly, to other greenhouse gases through an offset credit mechanism. The role of carbon dioxide in climate change is better understood, and economic methods for pricing it are more easily implemented than are those for other greenhouse gases. However, in order to promote cost-effective achievement of the environmental goal, other gases can be accommodated through a system of offset credits, within an instrument initially focused on carbon dioxide.

The Group's findings are summarized in the following recommendations, along with a reference to the appropriate section of text with further discussion.

[1] "No-regrets" measures are measures taken by governments, businesses, or institutions that result inemission reductions and that meet the normal economic investment criteria that are used for any other investment decision. The classification depends to a great extent on the organization's cost of capital and required payback period or rate of return.

Summary of Recommendations

Overall Context

If Canada is to meet its commitment to stabilize greenhouse gas (GHG) emissions by the year 2000, then the Climate Change Group recommends:

1. Canadians should establish a multi-stakeholder mechanism to manage greenhouse gases and the climate change issue in a way that integrates a range of approaches from "no-regrets" measures and subsidy removal to regulations and economic instruments (see Figure 1, page 13).

- Collaborative members should take a leadership role in establishing and participating in this process.

- The process should be open to representatives of all stakeholders likely to be significantly affected by the impact of climate change or climate change mitigation policies. Governments will be encouraged to link this process closely with their intergovernmental processes on climate change.

- This process should be established and underway in 1993.

2. Governments and other stakeholders should, as a priority, identify specific barriers restricting the adoption of "no-regrets" measures to reduce GHG emissions and then, where appropriate, take steps to eliminate these barriers.

- This should be a high priority element of a Canadian national action plan on climate change, and should be initiated through the multi-stakeholder process described in Recommendation 1.

3. Governments should establish a mechanism for the registration of voluntary "actions for credit" that limit net GHG emissions, and should encourage such actions.

- This mechanism should establish clear eligibility criteria and a consistent process for registration of voluntary actions for potential future credit. Members of the Collaborative are willing to work with the federal government to develop the details of such a mechanism, with a request for feedback and approval by the end of 1993.

4. Governments should, with stakeholder involvement, establish a process to review the impact of subsidies on GHG emissions; in the context of other policy objectives, governments should then take steps to eliminate subsidies wherever possible. This will allow for a better evaluation of the action required to achieve the appropriate reduction of GHG emissions.

- Collaborative members will approach Canadian governments to establish a process to review the impact of subsidies on GHG emissions. This action is in line with Canada's commitment in the Climate Change Convention to identify and review its policies and practices that encourage greater GHG emissions than would otherwise be the case.

5. Until such time as full-cost pricing is a reality, the instrument should include an interim mechanism to adjust the price of non-fossil fuel energy sources to reflect their other environmental impacts. Other interim mechanisms may also be required to address substitution impacts in other areas of economic activity.

Characteristics of an Economic Instrument

An economic instrument for GHG management should incorporate the following characteristics:

6. ***International competitiveness*** — The price placed on GHG emissions in Canada should be established with recognition of the impact on Canada's economy and relative competitiveness, and effort should be made to

coordinate actions with Canada's major trading partners.

7. ***Flexibility*** — The instrument should be implemented gradually to facilitate technological and economic adjustment, and to provide an opportunity to assess its environmental effectiveness.

8. ***Exemptions*** — Carbon dioxide emissions from biomass, and the carbon content of feedstocks for the production of petrochemical products should be exempted from the charge. The same applies to biomass-produced emissions, conditional however on a full life-cycle analysis of net impact on greenhouse gas emissions. Energy used in the production and conversion of biomass to a product such as ethanol would not be exempt.

9. ***Revenue neutrality*** — Net government revenue should not increase as a result of the charge. The revenues obtained by government through the use of the instrument must be balanced by a decline in government revenues from other sources. Members of the Collaborative have agreed that revenue neutrality does not eliminate the potential negative impact on the economy, but is one mechanism to reduce that impact.

10. ***Revenue recycling*** — Governments and stakeholders should jointly initiate and coordinate research to determine which option for recycling revenues will maximize economic and environmental benefits, minimize distributional impacts, and minimize the possibility of the instrument being used for additional revenue-generating purposes. This research should also determine the most appropriate jurisdictional level at which to apply the charge, as well as a specific strategy for achieving revenue neutrality.

As a first step, Collaborative members will meet with Finance Canada officials to discuss appropriate funding sources for this research.

11. ***Administration*** — Administration, monitoring, and enforcement mechanisms should be established with a clear objective of minimizing cost and maximizing effectiveness.

The Instrument

12. To ensure a broadly based instrument, capable of sending price signals through the entire economy and focused on all greenhouse gases, the Group recommends that a hybrid GHG instrument should be designed with two components:

i. a charge imposed both on carbon dioxide emissions from large stationary sources and on the carbon content of fossil fuels used by small stationary and mobile sources; and

ii. an offset mechanism in which deliberate domestic and international measures, resulting in the reduction of GHG emissions or in increased sequestering of carbon dioxide, can be credited against emission charges for whatever amount of emissions they offset. These credits would be easily transferable.

The instrument's design should incorporate the characteristics identified in Recommendations 6, 7, 8, 9, and 11.

Development of the Instrument

13. In the context of an overall integrated action plan for GHG management, the Climate Change Group recommends proceeding with detailed design of the recommended economic instrument. It is expected this will yield an instrument that meets the environmental, economic, and social criteria specified by the Group. If it does, the Group recommends that the instrument be implemented within the context of the overall management framework for greenhouse gases, and then managed, through an open process with meaningful stakeholder participation. If the selected

instrument does not satisfy the design criteria, alternative instruments will have to be evaluated.

14. Governments should support the development of a detailed technical design for the recommended instrument. This design project should be initiated by the fall of 1993 and should:

i. provide sufficient assessment of the economic and environmental impacts of the instrument such that final political and stakeholder decisions on implementation can be made; and

ii. include analysis and assessment of the micro-economic and social impacts of the application of the instrument on specific sectors and regions and, if necessary, recommend specific transitional strategies to mitigate negative effects. This analysis would forecast the socioeconomic impacts that would flow through the economy as a result of implementing the recommended instrument at various price levels.

As a first step, Collaborative members will meet with Environment Canada officials to determine how the funds designated by Environment Canada for economic instruments research can be used to meet this end. Other governments, departments, institutions, and industry associations will also be approached.

15. Governments and stakeholders, through a representative management committee, should jointly develop the terms of reference for, direct the research on, and review the final product of the design project.

16. The impacts of the instrument resulting from this detailed design process should be assessed against the proposed design criteria. The decision to proceed with implementation should be based on the results of this assessment and should be assessed within the management framework for greenhouse gases.

Future Role of the Economic Instruments Collaborative

17. For their own part, the members of the Climate Change Group commit to take the Group's conclusions to a wide range of constituencies in an effort to broaden support for these consensus recommendations.

18. Group members also undertake to participate in government processes that increase Canadians' understanding of economic instruments as an important policy tool to deal with the climate change issue.

ACKNOWLEDGEMENTS

The Climate Change Group of the Economic Instruments Collaborative acknowledges the contributions of:

- the funders of the Economic Instruments Collaborative;
- the individuals who so enthusiastically participated in, or observed the process of, the Climate Change Group, and the companies, agencies, organizations, and government departments that made it possible for them to do so;
- Dawn Farrell, who chaired the Group;
- Ann Coxworth and Imad Itani, who wrote this report; and
- Heidi Stauffer-Hill of TransAlta Utilities who was a valuable resource for the Group.

CHAPTER 1
INTRODUCTION

1.1 Collaborating on Economic Instruments

This report presents the consensus findings of the Climate Change Group of the Economic Instruments Collaborative. This group of people, representing a number of industrial and environmental organizations as well as the National Round Table on the Environment and the Economy, came together with government observers to examine the potential role and design of an economic instrument for managing Canada's GHG emissions. The members of the Climate Change Group are conscious of the concerns that exist with respect to greenhouse gases. These concerns will generate some responses in terms of policy and actions. The approach and recommendations of this report with respect to economic instruments are offered as a framework and pathway for policy and action that is, in the shared view of the group, superior to responses that might otherwise be adopted.

The purpose of such an instrument would be, in conjunction with many other mechanisms, to discourage the emission of carbon dioxide and other gases which affect the earth's radiation balance, by moving the price of activities that result in these emissions closer to their full environmental cost, without seriously harming the economies of Canada, its regions, and its industrial sectors. While detailed design work has not been carried out, the main features of a recommended economic instrument and the context in which it should be used are presented.

This report was researched and authored based on the guiding principles that are supported by the entire Economic Instruments Collaborative.

1.2 The Climate Change Group and Its Challenges

It quickly became apparent to the Climate Change Group that the nature of the problem posed by greenhouse gases is very different from problems resulting from acid-forming emissions and from emissions of nitrogen oxides and volatile organic compounds (so-called NOx and VOCs). These air quality issues were addressed by the other two working groups of the Collaborative.

The GHG issue is characterized by its complexity, by its global scope, by a wide geographical and time separation between cause and effect, by the extent to which the problem and its potential remedies are entangled in international economic and trade policies, and by the uncertainty which still exists regarding the timing and extent of its impacts. While many, but not all, experts agree on the potential for serious future impacts from climate change, there is a lack of consensus on how high a priority should be placed on addressing this problem, given all the other national and global issues confronting us. Nevertheless, following the 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro, a number of governments did make commitments and set goals for emission reductions. The Canadian goal was used by the Climate Change Group as a point of reference for the design of an economic instrument.

CHAPTER 2
THE NATURE OF THE GREENHOUSE GAS PROBLEM

The Climate Change Group approached its task of developing an instrument for managing Canada's greenhouse gas emissions with the objective of meeting both environmental and economic interests. The approach taken examines the potential role of economic instruments in helping Canada reach its stabilization commitment. No judgment is made on the appropriateness of that commitment. This report summarizes the Group's discussion on how, and in what context, to use economic instruments to control greenhouse gases. Given the diverse backgrounds and views which members of the Climate Change Group brought to the process, the outcomes represent significant progress.

While the task is not completed, an encouraging degree of consensus has been achieved on many of the thorny conceptual issues involved in the design of the instrument. The report also identifies several areas where further work must be done. Recommendations are made as to the kind of instrument that Canada could adopt, the process that should be followed to develop the instrument, and the management framework for determining the use of economic instruments within Canada's commitments.

2.1 The Greenhouse Effect

There is wide, but not unanimous, agreement among scientists that escalating emissions of certain gases as a result of human activity are threatening the earth's climate with impacts ranging from modest to potentially severe and dramatic. Among the predicted impacts are disruption of rainfall patterns, increased incidence of droughts, elevation of global temperature, devastating flooding of coastal areas, and widespread disruption of ecological and agricultural systems.

More than 300 scientists from around the world, who form the Intergovernmental Panel on Climate Change, agree that human activities are enhancing the greenhouse effect. The likely magnitude of the impacts, the varying impacts on different parts of the world, the timing of impacts, and the costs of reducing emissions are all subject to debate. Nonetheless, the predominant view is that prudent, precautionary action to reduce emissions should be taken long before final answers to these areas of uncertainty have been determined. Debate continues among the various stakeholders on what constitutes "prudent and precautionary" action. Additional references on this topic are provided in the Selected References appendix.

2.2 Greenhouse Gases

The global warming potential of greenhouse gases is independent of the location at which they are emitted. A tonne of carbon dioxide released in Canada has the same impact as a tonne released anywhere else in the world.

Varying degrees of uncertainty exist about the contribution of each gas to the elevation of the greenhouse effect. The principal greenhouse gases are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), with other gases playing a minor role. Current scientific thinking suggests that chlorofluorocarbons (CFCs) play a much less

significant role than previously thought and, in any event, these gases are being phased out. Elevated levels of greenhouse gas emissions are being released from a variety of sources:

- CO_2 — from burning of fossil fuels (coal, oil, natural gas), deforestation, and various industrial processes;
- CH_4 — from rice paddies, flooding, landfills, fossil fuel production, and domestic animals; and
- N_2O — from nitrogenous fertilizers, land clearing, biomass and fossil fuel combustion, and chemical operations.

A detailed analysis of Canada's GHG emissions appears in the paper by Jaques (1992). Carbon dioxide accounts for about 70 percent of the impact resulting from Canada's human-caused greenhouse gas emissions, with most of that CO_2 coming from the production and use of fossil fuels. Other gases are emitted in much smaller quantities than CO_2, but some of these have a much higher direct global warming potential per tonne than does CO_2. However some of them may also result in negative, indirect atmospheric warming effects, and therefore their net impact is less well understood than that of CO_2. The contribution of some greenhouse gases and activities causing their emission can only be roughly estimated at present.

2.3 Reacting to Uncertainty

As a result of the many uncertainties, opinion on the risk to human existence and to the environment as a whole ranges from denial of any danger to belief in catastrophic consequences. The need for prudent, precautionary action over the next decade, however, has been widely accepted. Canada's stabilization commitment, made in the 1990 Green Plan and re-affirmed in Brazil in June 1992, represents a compromise interpretation. Although the Group accepted Canada's commitment as a basis for developing its recommended actions, it is not the purpose of this report to validate the Canadian goal.

The estimated costs and benefits of stabilization actions vary with the assumptions people make about the economic impacts of suggested mechanisms to reduce GHG emissions. Some studies suggest that controlling CO_2 emissions will actually provide economic benefits for Canadians. Others forecast considerable societal costs such as slower economic growth and higher unemployment. Economic impacts may be expected from many different possible mechanisms for controlling CO_2 emissions, not only from economic instruments. This combination of uncertainty, the need for prudent, precautionary action if Canada's commitment is to be met, and the concern for minimizing damage to the Canadian economy and its competitiveness shaped the approach taken by the Collaborative in applying economic instruments to the issue of climate change.

CHAPTER 3
CANADA'S ROLE IN THE GLOBAL ISSUE

Canada's GHG emissions represent a small fraction of the global total, but are high on a per capita basis due to many factors including distance, weather, the high proportion of energy intensive industries located in Canada, and lifestyles. Members of the Climate Change Group agree that Canada should take a leadership role by taking responsible, achievable steps to control greenhouse gas emissions nationally, without seriously disrupting the competitiveness of the nation or its regions.

In addition, leadership also involves Canada pro actively influencing international actions. The Climate Change Group encourages Canada's negotiators on climate change to take on several tasks:

i. sharing, through the negotiating process, information on the learning experiences of the Collaborative, the multi-stakeholder process used to achieve consensus on the use of economic instruments for addressing air emissions issues in Canada, the reasons which led a Canadian multi-stakeholder group to conclude that a number of tools should be used to combat greenhouse gases and that further work should be done on the hybrid instrument recommended by the Collaborative;

ii. providing feedback to Canadians on similar work in other jurisdictions and its likely impact on the specific recommendations of the Collaborative; and

iii. pressing for international mechanisms to register initiatives to sequester and offset greenhouse gases in a way that is compatible with the hybrid instrument recommended in this report.

CHAPTER 4
CHOOSING A GOAL

Canada's commitment "to stabilize net greenhouse gas emissions at 1990 levels by the year 2000," stated in the 1990 Green Plan and reaffirmed at UNCED in June 1992, has been accepted by the Economic Instruments Collaborative as a goal for the work of the Collaborative. The Group does not necessarily endorse this Canadian commitment, either from the point of view of the priority that should be attached to the climate change issue in the context of the broad range of global problems, or in terms of the appropriateness of this goal for Canada. For the purposes of this work, the Group simply accepted that Canada has made this commitment, and that a framework for action is required if it is to be realized. The task of the Group was to see what role economic instruments could or should play in meeting the stated goal.

It is recommended that this stabilization goal be revisited on a periodic basis and modified in light of new information in areas such as:

- the scientific understanding of the impact of greenhouse gases;
- the environmental, social, and economic costs of those impacts;
- the costs and effectiveness of reduction strategies; and
- the actual, as distinct from predicted, GHG levels and changes in climate.

The Climate Change Group therefore believes that the stabilization goal should be viewed, for issue management purposes, as the first step of an ongoing, iterative process involving the:

- setting of an initial goal;
- design and implementation of an initial program of action;
- evaluation of emission reduction performance, costs, and new information;
- adjustment of the program; and
- setting of revised goals.

CHAPTER 5
THE POLICY CONTEXT FOR ECONOMIC INSTRUMENTS

Economic instruments are seen as an economically efficient tool that should be seriously considered within a framework for managing Canada's commitments toward controlling greenhouse gases. However, they represent only one of a number of parallel approaches which, together, could form a comprehensive Canadian strategy for managing GHG emissions. Indeed, it would not make sense to consider economic instruments in isolation from other, complementary, components of such a strategy.

Figure 1 (page 13) illustrates how the design of a recommended economic instrument relates to a suggested overall framework for managing greenhouse gases. The following components will all contribute to the integrated management of these gases, and are found in the overview in Figure 1:

- **Removal of barriers to "no-regrets" measures**

  Throughout the next decade, various GHG reduction measures which make sense in their own right should be encouraged. These so-called "no-regrets" measures (see footnote, page 2) generally involve energy conservation and efficiency actions, resulting in lowered energy expenditure, such that the cost of implementation is repaid from subsequent energy savings. Barriers which currently prevent "no-regrets" measures from achieving their full potential should be identified and removed. This should be a continuing process, as represented by the broken line in Figure 1. (See section 5.1.2 for further discussion.)

- **Removal of subsidies**

  Some existing economic development and energy subsidy programs work against the goal of GHG stabilization. A study of the impact of subsidy programs, represented by the solid line (1993-94), should be followed by an extended program of removal of inappropriate subsidies, represented by the broken line. (See section 5.2 for further discussion.)

- **Voluntary actions for credit** [2]

  Corporations and institutions should be encouraged to undertake voluntary actions that reduce greenhouse gas emissions or sequester carbon dioxide. A system of advance registration of such voluntary actions undertaken to reduce net GHG levels should be developed (solid line) and put into place (broken line) as soon as possible. Qualified actions would be eligible to earn credit against a possible future economic instrument. (See section 5.1.3 for further discussion.)

- **Traditional regulatory mechanisms**

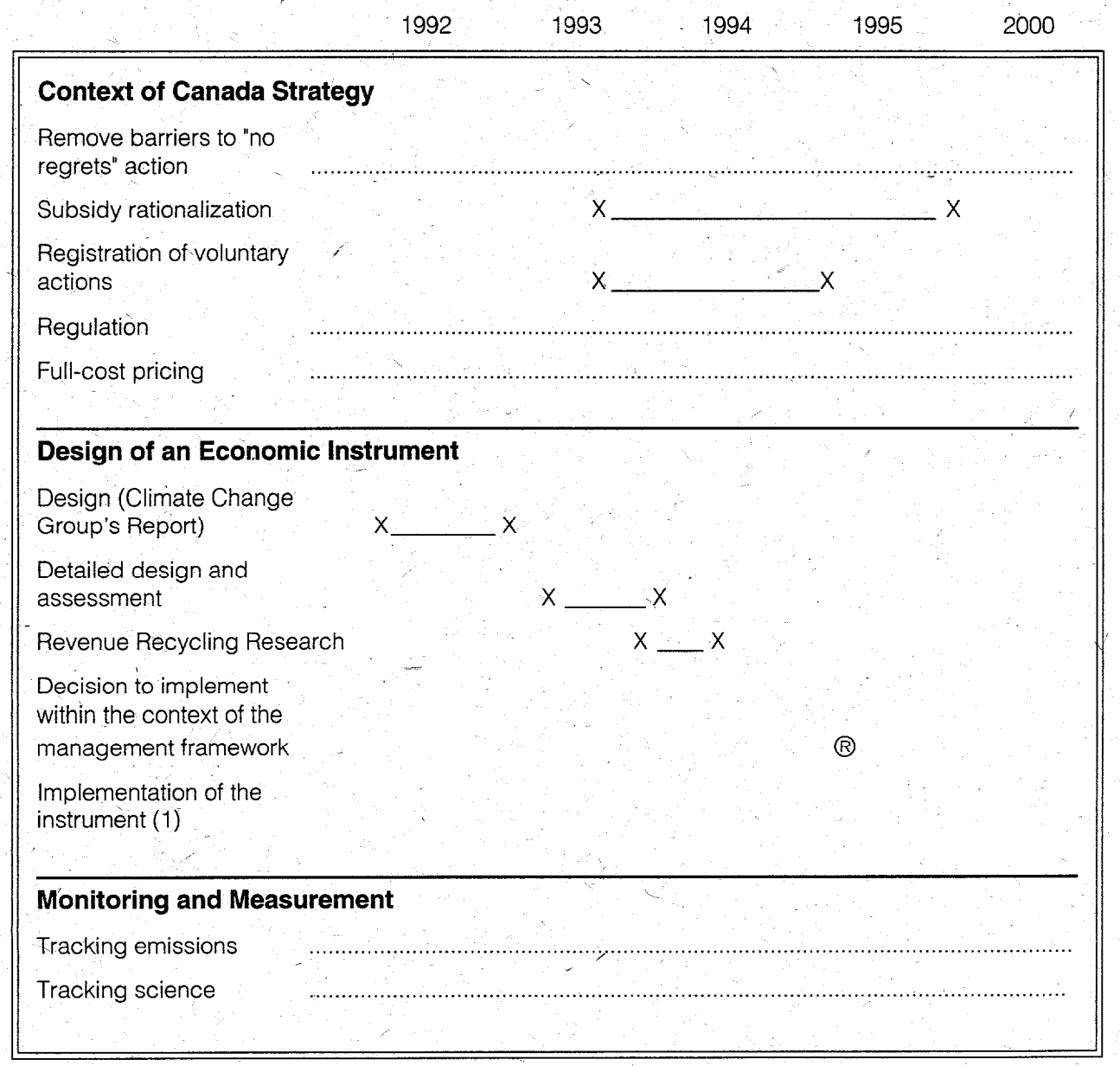
  Regulatory mechanisms that affect GHG emissions, such as energy efficiency standards and landfill operation requirements, will continue to play an ongoing role. (See section 5.1.1 for further discussion.)

- **Full-cost pricing**

  Full-cost pricing for all economic activity is a goal that is receiving increasing support as a mechanism to achieve environmental effectiveness

[2] The term "actions for credit" (or voluntary actions for credit) refers to investments by corporations or institutions that result in a quantifiable and permanent reduction of net emissions, and which may be made prior to the implementation of, or outside the scope of, an economic instrument. While the investment resulting in the emissions reduction may have multiple benefits, it would not have been made without the GHG reduction objective. Such actions could be eligible for future credit if and when an economic instrument is in place.

Figure 1. Canadian Strategy for Managing Climate Change



(1) Timing based on the results achieved by no regrets, subsidy removal and voluntary actions

Legend

X ___ X	Start — Finish
.....	Ongoing
®	Decision

and economic efficiency. The Group believes full-cost pricing should eventually provide a structure for appropriately building the estimated tangible and intangible costs of all environmental impacts into the pricing of goods and services. (See section 5.3 for further discussion.)

The development and application of an economic instrument as part of the overall strategy includes:

- **Conceptual design**

  The present report, completed in mid 1993, provides a conceptual outline and criteria for development and use of an economic instrument.

- **Detailed design**

  Detailed design of the instrument is recommended in the period 1993-94. If the selected instrument does not satisfy the design criteria, alternative instruments will have to be evaluated.

- **Revenue recycling**

  A study of the impact of various options for recycling revenues, generated for government by the instrument, back into the economy via the tax system will be a necessary component of the design task.

Decision to implement

The decision to implement the instrument should be based on the assessment of how well the design meets the criteria and objectives described further in this report, and should be made in 1994, as soon as possible after completion of the design task, and within the overall framework for managing greenhouse gases.

- **Implementation**

  If the above conditions are satisfied, implementation should take place within the framework of managing Canada's GHG emissions.

  Two other ongoing components of the strategy will involve:

- tracking GHG emission levels; that is, monitoring on an ongoing basis the actual net emission levels of the various greenhouse gases; and

- tracking scientific understanding of the issue; that is, monitoring the scientific literature to take advantage of the developing understanding of the causes, mechanisms, and impacts of climate change.

RECOMMENDATION 1: *Canadians should establish a multi-stakeholder mechanism to manage greenhouse gases and the climate change issue in a way that integrates a range of approaches from "no-regrets" measures and subsidy removal to regulations and economic instruments.*

- Members of the Collaborative will take a leadership role in establishing and participating in this process.

- The process should be open to representatives of all stakeholders likely to be significantly affected by the impact of climate change or climate change mitigation policies. Governments will be encouraged to link this process closely with their intergovernmental processes on climate change.

- The process should be established and underway in 1993.

It will also be necessary to take account of measures which may indirectly affect GHG emission levels. For example, measures introduced to reduce local air pollution, such as smog controls that shift people to public transit, could also reduce emissions of CO_2. Measures to avoid the possible negative environmental impacts which could result from inappropriate application of an economic instrument aimed at greenhouse gases must also be considered, such as problems resulting from a switch from fossil fuel to other energy sources with different negative environmental impacts.

These contextual considerations provide the framework in which an economic instrument should

be designed and introduced, and are discussed in the following paragraphs.

5.1 Other Approaches to Greenhouse Gas Emissions Control

There is a consensus that economic instruments can play a useful role as part of a comprehensive and integrated policy to address GHG emissions, along with traditional regulatory mechanisms, "no-regrets" measures, educational activities, and facilitation of voluntary actions for credit.

5.1.1 Traditional Regulatory Mechanisms

There are no regulations specifically restricting carbon dioxide emissions in Canada. However, regulations such as those concerning energy efficiency and building codes certainly have an indirect impact on CO_2 emission levels. Regulations that limit other types of emissions in order to protect local or regional air quality or to solve other environmental problems, may also result in lowered CO_2 emissions.

Any proposed economic instrument should be considered as part of an integrated set of policy instruments and not simply as an add-on or replacement for existing regulations. The use of economic instruments does not rule out the use of appropriate regulations to further aid in achieving emission reduction targets.

5.1.2 "No-Regrets" Initiatives

"No-regrets" measures are characterized by having short payback periods, in which the savings from avoided costs quickly cover any installation or set-up expenses, and then yield a net benefit for the consumer. They would meet economic evaluation criteria that would be used to test any other investment opportunity. They are deemed cost-effective, requiring no additional economic incentives. Examples could include upgrading of insulation, strategic replacement of inefficient electrical equipment, and use of control systems to reduce energy waste. Frequently, however, these measures face obstacles such as lack of public information and general awareness, lack of access to financing, poor technology transfer, product unavailability, or outdated and inadequate regulations.

RECOMMENDATION 2: *Governments and other stakeholders should, as a priority, identify specific barriers restricting the adoption of "no-regrets" measures to reduce GHG emissions and then, where appropriate, take steps to eliminate these barriers.*

Action to eliminate barriers to "no-regrets" initiatives should be a high-priority element of a Canadian national action plan on climate change to enable "no-regrets" measures to come closer to reaching their full conservation potential. Action should be initiated through the multi-stakeholder process described in Recommendation 1.

The use of an economic instrument and other measures to further reduce greenhouse gas emissions will therefore complement reductions from "no-regrets" measures. The more effectively these "no-regrets" measures can be used in working towards the GHG stabilization goal, the lower will be the costs resulting from application of an economic instrument.

5.1.3 Voluntary Actions for Credit

It is recognized that some firms are already considering, on a voluntary basis, activities to reduce or sequester GHG emissions. The economic instrument approach would complement, not replace, these actions.

RECOMMENDATION 3: *Governments should establish a mechanism for the registration of voluntary "actions for credit" that limit net GHG emissions, and should encourage such actions.*

This mechanism should establish clear eligibility criteria and a consistent process for registration of voluntary actions for potential future credit. Members of the EIC are willing to work with the federal government to develop the details of such a mechanism. It is believed that this mechanism can be established and implemented by the end of 1993.

5.2 Existing Policies That Send Inappropriate Price Signals

Members of the Group believe certain subsidies and tax policies, which have developed over time for various reasons, contribute significantly to the GHG problem. They can artificially lower the price of energy, encouraging increased use, which leads to increased emissions. This would result in conflicting market signals between subsidies and any future economic instrument.

The complexity and the emotional nature of the subsidy issue are recognized, as are its economic, sectoral, and regional implications. Nevertheless, the use of subsidies can clearly work against sending the right signals for both the cost of energy and the cost of emissions.

RECOMMENDATION 4: *Governments should, with stakeholder involvement, establish a process to review the impact of subsidies on GHG emissions; in the context of other policy objectives, governments should then take steps to eliminate subsidies wherever possible. This will allow for a better evaluation of the actions required to achieve the appropriate reductions of greenhouse gas emissions.*

Collaborative members will approach Canadian governments to establish a process to review the impact of subsidies on GHG emissions. This action is in line with Canada's commitment in the Climate Change Convention to identify and review its policies and practices that encourage greater GHG emissions than would otherwise be the case.

As with "no-regrets" measures, the greater the correction of price signals from subsidy removal, the greater the resulting reduction in GHG emissions and the lower the price required for an economic instrument to meet the remainder of the goal.

5.3 Relationship of Climate Change Responses to Other Environmental Issues

Climate change is obviously only one of a number of serious environmental problems resulting from different types of economic activity. The Group is concerned that any instrument it proposes not aggravate other environmental problems; this could happen if different activities with different environmental impacts were substituted for those targeted by the instrument.

Choices among electrical generation options were discussed, as an example. About 20 percent of Canada's carbon dioxide emissions result from the use of fossil fuels to generate electricity. Other generating systems, such as nuclear and large-scale hydro power, have other significant environmental impacts. Ideally, these should all be accounted for through a system of full-cost pricing which incorporates environmental and other external costs associated with all economic activities. Development of such a system is clearly beyond the mandate of the Collaborative, and the time frame of its development is such as to require consideration of interim mechanisms.

RECOMMENDATION 5: *Until such time as full-cost pricing is a reality, the instrument should include an interim mechanism to adjust the price of non-fossil fuel energy sources to reflect their other environmental impacts. Other interim mechanisms may also be required to address substitution impacts in other areas of economic activity.*

Waiting for full-cost pricing

Without simultaneous action to reduce the impacts of other energy sources and activities, an instrument directed at carbon fuels could simply encourage switching to non-carbon sources with different environmental impacts. The result would be reduced GHG emissions but an increase in other environmental impacts. The Group feels strongly that this is not a satisfactory solution.

The Group discussed measures to avoid unacceptable environmental impacts in the period until full-cost pricing is in place. One proposal, suggested as a temporary, interim mechanism, was the assignment of a charge to the major, non-fossil fuel electric power sources (nuclear and large-scale hydro). This charge would be designed to account for the environmental impacts of these options in a crude manner until such time as full-cost pricing could be more carefully researched and applied to other energy sources with greater resolution. As an example, it was suggested that one might consider treating nuclear and mega-hydro electrical energy sources as if they were equivalent in environmental cost to high-efficiency gas generation and apply the instrument on a kilowatt equivalent basis. Further discussion of this suggestion is required.

Note: In this report, boxes are used to enclose text or issues that the Climate Change Group considered important to include, but about which no final conclusion was reached and/or where further work is required to reach a consensus.

CHAPTER 6
ECONOMIC INSTRUMENT ALTERNATIVES

Having reviewed a wide range of instruments, the Climate Change Group focused its attention on those that are broad in their impact and send price signals through the whole economy, thereby increasing the price of GHG emissions. Such price signals can ultimately lead to a broad range of actions including behavioural changes and more innovative actions on the part of users/consumers and producers/importers.

It was agreed that a comprehensive approach was needed, but that discussion of options for primary economic instruments would be limited to measures for reduction of CO_2 emission levels, with other greenhouse gases being dealt with through a program of credits for offsets. This decision was made because of the various uncertainties and complexities associated with the impact of these other gases, the difficulties associated with measuring, monitoring and applying a charge for non-CO_2 greenhouse gases, and because CFCs are already being dealt with through regulation.

Carbon dioxide emissions from large and small stationary sources as well as from mobile sources all need to be included. A large portion of the Canadian contribution to the net increase in atmospheric CO_2 levels results from combustion of fossil fuels. A significant share comes from industrial processes that use carbonate compounds in reactive manufacturing processes, such as cement and lime production, quite apart from their energy use. There is generally a direct relationship between the fossil fuel or carbonate inputs and CO_2 emissions, so it is often not necessary to measure the actual output of CO_2.

There are two major choices to be made in selecting an economic instrument. The first relates to the type of instrument, and the second to the point at which it should be applied.

Appropriate instruments fall into two types: (1) charges on carbon or carbon dioxide emissions, and (2) tradable permits allowing the emission of fixed levels of carbon dioxide. Charges provide flexibility, in that they can be easily raised or lowered to adjust either the environmental or the economic impact of the instrument. Permits allow the cap for emissions to be fixed, with the market defining the price for permits. Initial distribution of permits can be done by giving them away to emitters, by selling them at an initial fixed price, or by auction.[3] The instrument could be applied either at the point of production or import of the fuel, and/or at the level of the consumer/end user. The Climate Change Group considered four options which result from the possible combinations of these alternatives:

- a charge applied at the producer/importer level;
- a permit applied at the producer/importer level;
- a charge applied at the consumer/emitter level; and
- a permit applied at the consumer/emitter level.

[3] Environment Canada (1992) and Nichols and Harrison (1991) discuss the charge and tradable permit systems in more detail.

CHAPTER 7
DESIGN ISSUES

A combination of "no-regrets" measures, regulatory initiatives, and selective subsidy removal may or may not, on their own, be successful in enabling Canada to meet its GHG stabilization goals. The Climate Change Group has therefore considered a variety of economic instruments that could address the anticipated shortfall by further reducing greenhouse gas emissions in Canada.

A successful economic instrument will be characterized by:

- provision of effective incentives for desirable behaviour by consumers;
- provision of effective incentives for innovation; and
- public and economic acceptability.

Following are some of the major design issues that were considered in the process of selecting an economic instrument.

7.1 Environmental Effectiveness

Regardless of the kind of economic instrument adopted, the quantitative outcome in terms of GHG emissions reduction is difficult to predict. Both the process of setting and monitoring goals, and the instrument itself, must be responsive to changing information.

A well-designed economic instrument will incorporate the following design features related to environmental effectiveness:

- mechanisms to ensure and to measure emission reductions and sequestering gains;
- the opportunity to re-examine the goal based on the development of new scientific information;
- time for stakeholders to evaluate progress in *moving towards the goal*; *and*
- mechanisms for adjusting the program.

7.2 International Competitiveness

Any discussion of economic instruments to deal with GHG emissions must address the issue of Canada's competitiveness in the world economy, particularly with our major trading partner, the United States. If Canada's trading partners do not implement comparable GHG emission stabilization policies, then any broad-based economic instrument might render Canadian goods less competitive on the world market, resulting in significant damage to Canada's economy. It could also result in goods being provided by a competitor outside Canada with less efficient production facilities, resulting in a net increase in global greenhouse gas emissions.

As a possible solution to this problem, the Climate Change Group looked at a proposal to exempt exports from GHG measures and to charge imports. However, it was concluded that while such a system might be administratively feasible for hydrocarbon fuel exports and imports, and for very highly energy-intensive goods, it would not work for most of the goods exported from or imported to Canada. Auditing the energy inputs to each good and the related emissions would be very complex and might prove impossible to administer.

Two other approaches for dealing with competitiveness concerns were therefore considered: the value of a harmonized approach and the possibility of unilateral action.

7.2.1 The Value of a Harmonized Approach

RECOMMENDATION 6: *The price placed on GHG emissions in Canada should be established with recognition of the impact on the Canadian economy, and efforts should be made to coordinate actions with Canada's major trading partners.*

If the United States implements an economic instrument to address climate change, it would be desirable that a similar price be placed on GHG emissions in Canada and the United States and that the potential impacts resulting from the relative positioning of each economy be harmonized. This would minimize the impacts on competitiveness for both economies. It would be beneficial, therefore, for Canada to work with the United States to harmonize price signals and policies resulting from measures to reduce greenhouse gas emissions.

The most feasible way to ensure this price harmony may be to implement similar economic instruments in Canada and the United States. However, such harmonization of instruments might limit Canada's flexibility to tailor its policy to address domestic objectives such as regional distributional concerns.

In addressing competitiveness concerns, simply adopting harmonious emissions targets would likely be much less effective than harmonizing the instruments. Two countries can have the same target, but the economic implications of the measures implemented for achieving that target may differ significantly between them. Even in the situation where only the goals are harmonized, the Climate Change Group believes there would be beneficial economic efficiencies to be gained from the application of a properly designed economic instrument.

7.2.2 If Unilateral Action Is Necessary...

Canada and the United States may not be able to agree on price signals, policy instruments, or environmental goals. In the context of a process in which Canadian stakeholders have set a goal and have found "no regrets" actions and subsidy removal to be inadequate for meeting the goal, it will be in Canada's best interest to use economic instruments, with careful consideration of issues of competitiveness.

While recognizing the need for firm price signals that will quickly begin to influence investment and consumption decisions, the Group believes that, in the situation of unilateral action, it will be particularly important for the economic instrument to be implemented gradually, especially in light of potential competitiveness implications.

Phasing-in of the instrument will:

i. allow for the gradual adjustment of the economy due to changes in price signals; and

ii. allow time for technical adjustment by industry.

Phasing-in will also allow time to incorporate reaction to:

i. evaluation of progress in achieving goals; and

ii. new information regarding science and competitiveness implications for the Canadian economy.

RECOMMENDATION 7: *The instrument should be implemented gradually to facilitate technological and economic adjustment and to provide an opportunity to assess its environmental effectiveness.*

Reactive CO_2 emissions

Most of Canada's net CO_2 emissions result from combustion of fossil fuels or from losses of carbon-sequestering sinks. A significant share also arises from industries such as cement and lime production, where large quantities of CO_2 are released from carbonate-based raw materials as a result of chemical reactions inherent in their manufacturing processes. The cement industry is one that will require careful monitoring to allow assessment of, and reaction to, the particular impacts it will experience when the instrument is introduced. The production of carbon dioxide is implicit in the process of making cement, quite apart from the use of fossil fuel as an energy source in the process. There is no known way of avoiding this. There are no clear alternatives to cement for many of its uses. Increased prices for cement, which would presumably result from an economic instrument aimed at CO_2 emissions, would be reflected in higher construction costs throughout the economy. There is also a concern that greater price differentials between Canadian-produced cement and offshore cement would encourage imports of this material, adversely affecting the domestic industry and possibly resulting in increased global CO_2 emissions if imports came from less energy-efficient sources. The gradual implementation of the instrument and its recommended flexibility will be particularly important to this industry.

7.3 Exemptions

RECOMMENDATION 8: *Carbon dioxide emissions from biomass, and the carbon content of feedstocks for the production of petrochemical products should be exempted from the charge. The same applies to biomass-produced emissions, conditional however on full life-cycle analysis of net impact on GHG emissions. Energy used in the production and conversion of biomass to a product such as ethanol would not be exempt.*

7.3.1 Carbon Dioxide from Biomass

The impact of biomass fuel combustion on net atmospheric CO_2 levels is complex and difficult to estimate. The following factors are involved:

i. Most biomass material left to decay naturally or burned as waste, ends up as GHG emissions, in the form of CO_2 and methane. Burning biomass as fuel merely changes the timing of that transformation.

ii. If a forest or other biomass source is managed on a sustainable basis, so that new growth constantly replaces harvested fibre, CO_2 absorbed by growing plants will balance that released by the burning or decay of harvested plants. Therefore, with sustainable forestry practices, there will be no net change in atmospheric CO_2 levels, and it is appropriate to exempt sustainably produced biomass fuel from any economic instrument. However, truly sustainable forest management is probably not occurring in many portions of Canada's forest industry at this time. In addition, rates of uptake of CO_2 by growing trees vary with species, maturity, and conditions of growth.

Because of these complexities, the Climate Change Group recommends that, for the initial implementation, all biomass sources be exempt from the instrument.

In future, this exemption should be linked with the demonstration of sustainable forest management, biomass growth, and land use. It is significant to note that fossil fuels used in the production of biomass fuel, for example grain-based ethanol, will be subject to the instrument. Therefore biomass production methods that involve large amounts of fossil fuel energy input will be discouraged. The same will be true for other renewable fuel sources or technologies that use fossil fuel inputs.

7.3.2 Petrochemical Feedstocks

In addition to their use as fuels, hydrocarbons are used as feedstock for petrochemicals. Carbon contained in petrochemical products such as plastics generally will be fixed in the product for an extended period of time. Therefore it is reasonable to exempt hydrocarbons used in this way from the instrument. If waste plastics are later used as fuel in energy-from-waste plants, or incinerated, they should be subject to the instrument at that point, based on their carbon content. Fossil fuel energy used in the production of petrochemicals would be subject to the instrument just as energy used in any other industry would be.

The role of volatile solvent products in the greenhouse effect is acknowledged, and it might be possible to later extend the instrument to take account of this. Initially it is being addressed through reduction measures regarding the role of solvents in generation of ground-level ozone and smog associated with NO_x/VOC emissions.

7.4 Revenue Recycling

It will be important to improve both public understanding of the significance of the climate change issue and public appreciation for the potential role economic instruments can play in improving the management of emissions that cause the problem.

Several of the economic instrument options proposed could involve large transfers of wealth from emitters to government(s) in the absence of measures for revenue recycling as well as have a negative impact on the Canadian economy. To gain public and political support for the introduction of such an instrument, the Climate Change Group believes it will be critical for governments to determine and employ effective ways to fully recycle such additional revenue back into the economy, so the instrument can be truly revenue neutral and have minimal negative economic impacts.

RECOMMENDATION 9: *Net government revenue should not increase as a result of the charge. The revenues obtained by government through the use of the instrument must be balanced by a decline in government revenues from other sources. Members of the Collaborative have agreed that revenue neutrality does not eliminate the potential negative impact on the economy, but is one mechanism to reduce that impact.*

These carbon-related revenues should not be "earmarked" for any additional expenditure. In this way, the instrument will be recognized as a tool to achieve a socially desirable environmental goal, rather than just another means of raising revenue for government(s).

Governments have many options for reducing revenue to counterbalance that collected though the use of an economic instrument; among these, in no particular order, are:

- reducing GST;
- reducing personal income tax;
- reducing corporate income tax;
- reducing employer-paid social service contributions; and
- increasing investment tax credits.

The Group believes the various options for revenue recycling should be assessed against a range of criteria, including the following:

- effectiveness in achieving the environmental goal;
- minimizing negative impacts on the Canadian economy;
- maximizing positive impacts on employment;
- maximizing public acceptance;
- maximizing Canadian competitiveness;

- mitigating negative impacts on regions, segments of society, and industrial sectors; and
- maximizing administrative efficiency.

It may be impossible to find one revenue-recycling option that meets all these criteria. It may, therefore, be necessary to identify a suite of tax reductions that, in combination, will meet these criteria. (See Recommendation 10 in section 7.5.2.)

7.5 Regional and Jurisdictional Issues

7.5.1 Jurisdiction for Application of an Economic Instrument

Three distinct considerations relate to jurisdiction over the collection and recycling of any revenues raised through a carbon charge:

- Who should collect it?
- Whose money is it?
- Who should decide how to recycle it?

The Canadian constitution does not specify exclusive jurisdiction in this area for either level of government. The charge likely could be collected by either the federal or provincial governments.

If the economic instrument chosen is effective in helping Canada achieve its GHG emissions targets; if it is truly revenue-neutral; and if it does not seriously harm the economies of Canada and its regions, all jurisdictions and all Canadians should benefit. Since all revenues generated by the instrument should be recycled to neutralize, to the greatest extent possible, any negative impacts on the economy and on low income groups, there should be no overall revenue windfall to governments.

However there may be some shifting of the net tax burden among sectors or regions. It must be recognized that there exists a significant degree of distrust between governments, and that some provinces are concerned that a GHG instrument could result in a transfer of wealth from their region. To avoid triggering disruptive and time-consuming disputes between governments or among stakeholders, these distributional concerns must be addressed.

7.5.2 Regional and Sectoral Differences in Dependence on Fossil Fuels

The Climate Change Group was concerned that the introduction of new measures penalizing heavy users of fossil fuels for electrical generation and industry will unevenly affect different regions of the country. Provinces such as Alberta, Saskatchewan and Nova Scotia, which rely heavily on coal-fired electrical generation, would be hit much harder by an economic instrument than would Manitoba and British Columbia, for example, which rely much more on hydroelectricity. The instrument could cause an unacceptable transfer of wealth out of these coal-dependent economies into other regions of Canada, and would thus lack the support of the affected provinces.

Representatives of large emitters of CO_2 also expressed concern that their companies had, in times past, committed long-term capital investments based on the regulations and legislation in place at that time. They make a case for not changing the rules for projects that are already committed or in place.

Possible approaches to avoid regional and sectoral inequities were discussed, but specific solutions were not developed.

RECOMMENDATION 10: *Governments and stakeholders should jointly initiate and coordinate research to determine which option for recycling revenues will maximize economic and environmental benefits, minimize distributional impacts, and minimize the possibility of the*

Options for dealing with inequities of regional and sectoral impacts of the instrument

One way to deal with the concern about some regions being hit much harder than others by the instument is to have the provincial, rather than the federal, government levy the charge or sell the permits within a nationally coordinated program. This would guarantee that wealth generated in these more carbon-dependent provinces would remain there. However, this solution would not address the concern about certain sectors of the economy being unduly burdened, unless the provincial governments were to recycle revenues in such a way that the impact of the charge on those sectors would be neutralized. This would probably not be broadly acceptable.

Another approach would be, in the case of large stationary emitters, to apply the economic instrument only to GHG emissions over and above 1990 levels. In this case, if a charge system were chosen as the instrument, for large stationary emitters, charges would be applied only on emissions above 1990 levels. Companies would be given transferable credit for reducing their emissions below 1990 levels. If an emitter in one of the carbon-intensive regions were to reduce its emissions below 1990 levels, it could sell the permits it no longer requires to an emitter outside the region. This would help defray the economic impact on the region. If a permit system were chosen, permits would be freely allocated at 1990 levels for large stationary emitters. With this system, regions and sectors that had invested heavily in fossil fuel systems would not be particularly penalized for past decisions, but the instrument would influence future decisions.

There are concerns with this approach however. If emissions up to 1990 levels were permitted free for each source, emitters who operated more efficiently than average would receive no benefit for so doing. One variation would be to freely allocate permits for emission up to 1990 levels to large stationary sources on the basis of industry average efficiency or some other similar measure, rather than on the basis of each emitter's 1990 level. The advantage of this variation would be that it would reward those who have made decisions in the past that contribute to a solution of the problem. It could also have potential for gathering broad public and political support.

But the whole concept of exempting up to 1990 levels is subject to other concerns. Because it is impractical to apply it to other than large stationary emitters, it would result in small-scale and mobile emitters being charged on their emissions, while the large-scale emitters would pay only on their above-1990-level emissions. Similarly, the large-scale emitters would have the opportunity to make money by selling their pre-1990 level rights, while other emitters would not.

Also, the implication that those who have been heavy emitters historically, have been allocated a "right" to emit at those levels, alarms some members of the Climate Change Group. Such a concept could have major implications if it were extended to the international arena. If it were assumed that countries like Canada, which industrialized relatively early, had the "right" to emit up to their 1990 levels, while developing countries, which will not reach their industrial potential until later, had the right to only emit up to their pre-industrial levels, the result could be perpetuation of the current unequal levels of industrialization.

The consensus of the group was that further research is required both on the process of administration of a GHG charge or permit system and on measures to ensure that revenues are fully and transparently recycled in a manner that deals fairly with the concerns about inequitable regional and sectoral impacts.

instrument being used for additional revenue-generating purposes. This research should also determine the most appropriate jurisdictional level at which to apply the charge, as well as a specific strategy for achieving revenue neutrality.

As a first step, Collaborative members will meet with Finance Canada officials to discuss appropriate funding sources for this research.

7.6 Credit for Offsets

The difficulty of designing a comprehensive, broadly based instrument certain to achieve Canada's environmental goal for net GHG emissions reduction in an economically acceptable manner has been recognized by the Climate Change Group.

One means of incorporating significant flexibility in an economic instrument is to introduce an offset/credit system. This would allow credits to be made available for various offsetting activities that contribute to reduction of net GHG levels, either by reducing emissions or by creating sinks. Credits would be applied directly against the charges to be paid by an emitter on the basis of tonnes of CO_2-equivalent of avoided emissions or the amount sequestered. Credits would be transferable, thus enabling the development of a secondary market in which credits could be bought and sold. This would further enhance the achievement of the environmental target in the most cost-effective manner.

An offset/credit system would allow collaboration among users/emitters and among sectors to their mutual benefit, and would encourage innovative approaches to reducing net emissions. It would also provide a mechanism for addressing greenhouse gases other than carbon dioxide.

However, the issue of offsetting credits is complicated by the fact that there are both natural and man-made sources of, and sinks for, various greenhouse gases. The distinction between the two is not always clear. Human actions designed to sequester greenhouse gases often build on natural processes such as afforestation.

The Climate Change Group attempted to define criteria that will allow appropriate credit for sequestering of CO_2 and other greenhouse gases, as well as for reduction of emissions of various greenhouse gases. The intention is to design economic instruments that come as close as possible to accounting for net GHG emissions. Three types of offset/credit situations are discussed:

- domestic CO_2 sinks;
- domestic emission-reduction measures for greenhouse gases; and
- international GHG sinks or emission-reduction measures.

An Example:
How would offsets and credits work?

The following examples illustrate how offsets/credits could be applied.

1. Suppose Canada implemented a charge of $10.00 per tonne of CO_2 emitted. Canadian Company X initiates and maintains a tree-planting project in Canada on 1,000 acres. Assume that this project sequesters 10,000 tonnes of CO_2 per year at a cost to the company of $8.00 per tonne. The company will receive a credit for 10,000 tonnes, assuming the project meets all the criteria described in section 7.6.1.

Case a. If Company X emits CO_2, it can now use its credits to offset some or all of the charges levied on it for emissions. If, for instance, the company emits a total of 20,000 tonnes of CO_2, it will only pay for 10,000 tonnes at $10.00 per tonne, and will use its 10,000-tonne sequestration credit to balance the remainder. This will result in a total cost for the CO_2 emission for Company X of $180,000 (10,000 x $8 for the tree-planting project + 10,000 x $10 for the CO_2 charge), rather than the $200,000 it would have cost if the company had opted to pay the charge on all 20,000 tonnes.

Case b. If Company X emits only 5,000 tonnes, it can use 5,000 tonnes of its sequestration credit to offset its charge requirement, at a cost of $40,000 (5,000 x $8) rather than paying the CO_2 charge of $50,000 (5,000 x $10), thereby saving $10,000 on emission charges. The company will still have a balance of 5,000 tonnes of offset credit which it can bank for future use or sell on the open market. The asking price will be between $8.00 and $10.00 per tonne, resulting in an additional benefit with a maximum potential of $2.00 per tonne, or an additional $10,000 in total.

2. Company Y in Canada upgrades a coal-powered electrical generation plant outside Canada. This activity results in a 500-tonne-per-year reduction in CO_2 emissions, for which Company Y will be issued a credit, assuming that all criteria are met. As in the previous example, the credits can be used to offset charges or may be sold on the open market to another company.

7.6.1 Domestic CO_2 Sinks

Carbon dioxide credits would be earned for such activities as planting and maintaining trees on the basis of CO_2 permanently sequestered. Credits would be provided for afforestation that signifies a land use change. Because the proposed instruments do not apply a charge on the removal of carbon sinks by forest harvesting, it is not appropriate to offer credits for the replanting of harvested forest lands that would be part of normal, responsible forest management. Carbon dioxide offsets and credits would be limited to additional sequestration where it can be demonstrated that the area would not have naturally reforested. Tree-planting projects could be carried out by various groups and agencies on behalf of the holders of the transferable offset credits. Other kinds of sequestering projects, such as use of CO_2 in enhanced oil recovery, would be evaluated on a case-by-case basis.

To receive credit, offset projects would need to meet the following criteria:

Credibility - There is an accepted scientific basis for the offset and a proven baseline. Without the project or investment, the offset would not have occurred.

Sustainability - Projects must be socially, economically, and environmentally sustainable; for example, they must meet the legitimate socioeconomic and development needs of the region.

Projects must be permanent or ongoing, otherwise credits will be adjusted for changes in the project's CO_2 sequestering capability over time.

Dependability - The project proponents and implementors are recognized, experienced, and credible organizations.

7.6.2 Domestic Emission Reductions of Greenhouse Gases

Emitters of CO_2 would be eligible to receive credit for reducing levels of greenhouse gases. To earn credits, offset projects would have to meet the same criteria as those described above for domestic CO_2 sinks. Some questions of equivalence of impact among various greenhouse gases remain to be resolved as knowledge increases. Credit for sequestering or limiting emission of gases will be given when there is generally accepted understanding of the relative impact attributable to those gases.

7.6.3 International Actions

In the deliberations of the Climate Change Group, the use of credits for international actions to reduce GHG emissions or to develop sinks was the most difficult issue on which to reach agreement.

There is consensus that the instrument should allow for some portion of the charges for emissions within Canada to be offset by actions which either reduce GHG emissions or create CO_2 sinks outside Canada, as long as certain criteria are met. Permitting such credits can improve environmental effectiveness, economic efficiency, and competitive positioning for Canada. While some members believed that it is crucial for Canadians to make progress in limiting their own emissions, so as to have credibility and to set an example internationally, other members believed that international offsets are a key factor for ensuring Canada's competitiveness. The extent to which Canadian emitters should be allowed credit for GHG reduction or CO_2 sequestering actions taken outside of Canada remains unresolved.

The Climate Change Group therefore favors the development of a mechanism to ensure a balance of domestic and international measures.

It was agreed that the priority is to get beneficial activities started, regardless of how the goal is defined, realizing that the goal is going to be revisited as the program develops, as new information is reviewed, and as the benefits of learning and experience are gained.

The Climate Change Group suggests the following plan for balancing Canadian and international initiatives:

i. Pursue action in Canada where emissions result from activities that are wasteful and inefficient (that is, not caused solely by climate, transportation requirements, or energy-intensive industries).

ii. Take action overseas where multiple environmental benefits can be realized.

iii. Act in concert with Canada's major trading partners and avoid penalizing Canada's competitiveness.

The role of international offsets in reaching the goal

Many environmental organizations favour assigning a lower limit on the Canadian goal which must be met by domestic actions. Indeed, some believe that the entire goal should be achieved domestically. Canadian-supported, international actions that are used as offsets against the domestic instrument would then provide a bonus emissions-saving over and above the Canadian goal. Most industry representatives believe the need to maximize cost-effectiveness and flexibility would preclude arbitrarily assigning limits on undertaking action.

An alternative approach, which the Group discussed, could perhaps reduce or avoid the need to worry about what percentage should be achieved through domestic actions. In this system, international action would receive a reduced credit; for example, two units of international reductions or sequestering might be required to offset one unit of domestic emissions.

Additional work is required to reach consensus on how much domestic action is minimally acceptable, and the type of mechanism that would most effectively ensure that it is achieved. The Climate Change Group will try to advance the consensus and understanding of this issue. Identifying specific offset projects, developing detailed eligibility criteria, and piloting some actual offset projects on a voluntary basis may greatly assist in achieving such a consensus.

To be able to make use of international offsets or credits, a system with the following characteristics will have to be planned and implemented:

Registration — A credible international organization would register such projects. Registration would include an evaluation and assignment of the contribution to be credited to each participant in a collaborative project.

Monitoring — Projects would have to be monitored to assure compliance and sustainability of sequestering activities or reduction measures. Proper environmental audits and/or emission or sequestering measurements would have to be conducted and reported.

In addition, eligible projects would have to meet strict criteria that address the need to:

- be ecologically sound and free of negative environmental impacts, with a priority for those with multiple environmental benefits; and
- meet the legitimate socioeconomic and development needs of the host country and local residents.

7.7 Credibility, Administration, and Monitoring

Credibility and transparency are essential characteristics of any instrument for dealing with GHG emissions. The Climate Change Group concluded that the following systems will be needed:

- a monitoring agency to check for compliance;
- an enforcement mechanism to bring violators into compliance; and
- penalties to deter future violations.

RECOMMENDATION 11: *Administration, monitoring, and enforcement mechanisms should be established with a clear objective of minimizing cost and maximizing effectiveness.*

An existing, central regulatory agency should be charged with monitoring and enforcement responsibility. Regulatory efficiency will be of high priority to minimize administrative costs. Individual companies would be responsible for filing annual

proof of compliance. Like tax audits, a random sample could be chosen for auditing. Similarly, appropriate use of penalties must be built into the system to minimize the probability of fraud. The Group also recognizes the need to develop and use credible organizational and/or environmental accountants and auditors to monitor all offsets.

7.8 Visibility

The Climate Change Group members agree that to bring about desired behavioural change, economic instruments must be clearly visible to the end user. Price signals should be clearly apparent to the person who makes the decisions about greenhouse gas-emitting activities; for example, the charge would be identified on fuel bills as is the GST. This will help to ensure that rational economic decision-making by consumers supports the environmental goal.

7.9 Technical Breakthroughs

It is conceivable that presently unanticipated, technical innovations may occur in the future, allowing new approaches to GHG emission reduction which are not accommodated by the initial instrument design. For example, suppose a car designer were to invent something that would capture CO_2 in the engine. A charge based on carbon content of fuel provides no incentive for consumers to buy cars with this feature. Sufficient flexibility needs to be built into the instrument so that it can, if necessary, be adjusted to take account of such unexpected new technology. The economic instrument chosen should be flexible enough to allow provision of incentives for innovations of this type, which are not directly motivated by a price on emissions or offsetting credits.

CHAPTER 8
DESCRIPTION OF INSTRUMENT

It is important to reiterate the context in which the Climate Change Group believes an economic instrument should be considered. Priority should be placed on:

- an ongoing process to remove inappropriate market signals such as certain subsidies that encourage GHG emissions;
- pursuing other steps to allow "no-regrets" measures to achieve their potential; and
- working with major trading partners to attempt to develop a joint, effective, and least-cost strategy to reduce emission levels.

A Canadian economic instrument should be phased in, so as to minimize economic disruption. This will need to take place in a timely manner if the stabilization goal for the year 2000 is to be achieved.

RECOMMENDATION 12: *To ensure a broadly based instrument, capable of sending price signals through the entire economy and focused on all greenhouse gases, the Group recommends that a hybrid GHG instrument should be designed with two components:*

i. a charge imposed both on carbon dioxide emissions from large stationary sources and on the carbon content of fossil fuels used by small stationary and mobile sources; and

ii. an offset mechanism in which deliberate domestic and international measures, resulting in reduction of GHG emissions or in increased sequestering of carbon dioxide, can be credited against emission charges for whatever amount of emissions they offset. These credits would be easily transferable.

This hybrid instrument provides a clear price signal to consumers, includes all greenhouse gases, is flexible, and encourages innovation for all energy and non-energy sources of greenhouse gases.

The instrument's design should incorporate the following characteristics (as described on pages 2-3):

- ***International competitiveness***
- ***Flexibility***
- ***Exemptions***
- ***Revenue neutrality***
- ***Administration***

The arguments that shaped the choice

The Climate Change Group believes it is important that the instrument chosen result in a consistent price signal throughout the economy, affecting all GHG emitters and fossil fuel users. Large stationary sources (e.g., residential and electrical generation plants), small stationary sources (e.g., residential and commercial fuel users), and mobile fuel users (transportation) should all be affected by the instrument.

The Group discussed whether the instrument should be aimed at producers and importers of fossil fuels, or directly at the large, stationary emitters of carbon dioxide and smaller users of fossil fuels.

It is recognized that administering the instrument would be simpler if directed toward producers and importers, because there are simply fewer of them to deal with. However, an economic instrument is intended to alter behavior by providing effective price signals, and these signals will be clearer if the instrument is directed at emitters and end users. If the instrument were applied at the producer/importer level, the price signal would not be as apparent by the time it reached the energy user, and it would be harder for energy users to link the price signal directly to their behaviour.

In considering the option of charges or permits, the Group selected an emission charge system, complemented by offsets. It is clear that many varied activities to reduce GHG emissions are being or will be undertaken (e.g., subsidy removal, "no-regrets" measures, and others). These will result in an uncertain level of reduction in GHG emissions. Therefore, the size of the impact required from the economic instrument in order to reach the goal is unknown. To implement a permit system, the amount of the impact required should be known so that the total cap permitted can be established. An emission charge, on the other hand, allows for gradual introduction with room for adjustments as needed.

The Group also concluded that a charge system complemented by offsets would send a more effective price signal than an emission permit/offset instrument. Hydrocarbon fuel users would have more difficulty receiving price signals in a permit system because end users would not be buying the permits. In a charge system, users would be aware of the charge with each fuel purchase.

With most of the large industrial emitters, carbon dioxide emission levels can be assumed on the basis of the type and quantity of fossil fuel consumed. Emissions from small fuel users will be proportional to the type and quantity of fuel consumed. However industries such as cement and lime plants, which emit carbon dioxide from their process apart from their fuel use, may require monitoring of actual emission levels.

It is important to build into the design of the instrument, mechanisms that will allow the instrument to be modified as learning and experience occur. The developing, testing, and adjustment of the instrument will be an ongoing learning and research process. The Group suggests that the impacts of the instrument be monitored by the multi-stakeholder body recommended in Section 5, and that body should also advise on how the instrument should be adjusted in the light of experience and new information.

CHAPTER 9
NEXT STEPS

To move toward implementing an instrument such as that outlined above, a number of steps will be required.

RECOMMENDATION 13: *In the context of an overall integrated action plan for greenhouse gas management, the Climate Change Group recommends proceeding with detailed design of the recommended economic instrument. It is expected this will yield an instrument that meets the environmental, economic, and social criteria specified by the Group. If it does, the Group recommends that the instrument be implemented, and then managed, through an open process with meaningful stakeholder participation.*

RECOMMENDATION 14: *Governments should support the development of a detailed technical design for the recommended instrument. This design project should be initiated by the fall of 1993 and should:*

i. provide sufficient assessment of the economic and environmental impacts of the instrument such that final political and stakeholder decisions on implementation can be made; and

ii. include analysis and assessment of the micro-economic and social impacts of the application of the instrument on specific sectors and regions and, if necessary, recommend specific transitional strategies to mitigate negative effects. This analysis would forecast the socioeconomic impacts that would flow through the economy as a result of implementing the recommended instrument at various price levels.

As a first step, Collaborative members will meet with Environment Canada officials to determine how the funds designated by Environment Canada for economic instruments research can be used to meet this end. Other governments, departments, institutions, and industry associations will also be approached.

RECOMMENDATION 15: *Governments and stakeholders, through a representative management committee, should jointly develop the terms of reference for, direct the research on, and review the final product of the design project.*

The need for a detailed examination of options for recycling of revenue generated by the instrument back into the economy, and design of the best mechanism for doing this, have already been discussed.[4]

RECOMMENDATION 16: *The impacts of the instrument resulting from this detailed design process should be assessed against the proposed design criteria. The decision to proceed with implementation should be based on the results of this assessment and should be assessed within the management framework for greenhouse gases.*

The concept of economic instruments is still neither generally familiar to, nor understood by the public. Such familiarity and understanding will be essential prerequisites to acceptance of market-based approaches to greenhouse gas control.

RECOMMENDATION 17: *For their own part, the members of the Climate Change Group commit to take the Group's conclusions to a wide range of*

[4] See Section 7.4 and Recommendation 10 in Section 7.5.2.

constituencies in an effort to broaden support for these consensus recommendations.

RECOMMENDATION 18: *Group members also undertake to participate in government processes that increase Canadians' understanding of economic instruments as an important policy tool to deal with the climate change issue.*

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