National Round Table on the Environment and the Economy

Table ronde nationale sur l'environnement et l'économie

Policies That Could Complement a Domestic Emissions Trading System for Greenhouse Gases

Domestic Greenhouse Gas Emissions Trading
Technical Paper Series

Droits d'échange d'émission nationaux des gaz à effet de serre
Série de documents techniques

Policies That Could Complement a Domestic Emissions Trading System for Greenhouse Gases

Prepared for:

Multistakeholder Expert Group on Domestic Emissions Trading

National Round Table on the Environment and the Economy

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Mandate

The National Round Table on the Environment and the Economy (NRTEE) was created to "play the role of catalyst in identifying, explaining and promoting, in all sectors of Canadian society and in all regions of Canada, principles and practices of sustainable development." Specifically, the agency identifies issues that have both environmental and economic implications, explores these implications, and attempts to identify actions that will balance economic prosperity with environmental preservation.

At the heart of the NRTEE's work is a commitment to improve the quality of economic and environmental policy development by providing decision makers with the information they need to make reasoned choices on a sustainable future for Canada. The agency seeks to carry out its mandate by:

- advising decision makers and opinion leaders on the best way to integrate environmental and economic considerations into decision making;
- actively seeking input from stakeholders with a vested interest in any particular issue and providing a neutral meeting ground where they can work to resolve issues and overcome barriers to sustainable development;
- analyzing environmental and economic facts to identify changes that will enhance sustainability in Canada; and
- using the products of research, analysis and national consultation to come to a conclusion on the state of the debate on the environment and the economy.

The NRTEE has established a process whereby stakeholders themselves define the environment/economy interface within issues, determine areas of consensus and identify the reasons for disagreement in other areas. The multistakholder approach, combined with impartiality and neutrality, are the hallmarks of the NRTEE's activities. NRTEE publications address pressing issues that have both environmental and economic implications and which have the potential for advancing sustainable development.

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Introduction

This is one of a series of papers prepared for the National Round Table on the Environment and the Economy (NRTEE) that examines design issues common to a variety of potential domestic greenhouse gas emissions trading systems. While emissions trading is widely acknowledged as having tremendous potential to improve the cost-effectiveness of actions to reduce greenhouse gas emissions, it is likely that it will only be part of the portfolio of policies governments will ultimately need to adopt to meet climate protection commitments. Other policies are likely necessary to ensure environmental effectiveness, economic efficiency, equity and political feasibility.

This paper examines several different types of policies that could complement the introduction of a domestic greenhouse gas emissions trading system in Canada. It provides a rationale for the use of these types of policies and provides some specific examples of policies that could be implemented to meet the objectives. While the paper does not make recommendations with regard to which specific policies should be implemented to support a domestic emissions trading system, it does clearly make the case that such policies will be required if a domestic emissions trading program is to be successfully implemented in Canada.

To be more specific, this paper argues that a domestic emissions trading system in Canada should be implemented in conjunction with the implementation of specific policies that:

- increase the effectiveness of the emissions trading system;
- remove barriers to the implementation of cost-effective emission reductions;
- promote equity within the emissions trading system and address concerns about the system's distributional impacts; and
- reduce emissions from sources not covered by the emissions trading system to ensure that no sector or region bears an unfair burden in Canada's efforts to meet its greenhouse gas emission control commitments.

Each of these forms of complementary policies is discussed in turn in the following pages.

Complementary Policies That Can Increase the Effectiveness of a Domestic Emissions Trading System

To be effective, a domestic emissions trading system for greenhouse gases (GHGs) must be complemented by policies that provide incentives for trading by creating a demand for GHG emission reductions. In addition, a domestic emissions trading system will require complementary policies that ensure the integrity of the trading system by establishing clear rules for determining the ownership of emissions reduction credits and allowances, and liability regarding the validity and sufficiency of credits.

The need for these types of policies is well understood; indeed, such policies are often considered less as complementary policies and more as mandatory elements of greenhouse gas emissions trading system design. Accordingly, these types of policies will only be discussed briefly in this paper, and reference will be made to other NRTEE papers that discuss these issues in more detail.

Policies That Create a Demand for Greenhouse Gas Emission Reductions

Two different types of policies are required to create a demand for greenhouse gas emission reductions. The first type of policy establishes a requirement (usually

regulatory) to reduce GHG emissions while also allowing the use of emissions trading to meet the requirement. The second type of policy ensures that this requirement is enforced.

In an allowance trading program (NRTEE Options 4, 11, 13 and 14), a regulated cap on the emissions of participating sources is the complementary policy that provides a strong incentive for those sources to seek out greenhouse gas emission reductions. Issues related to the establishment and subsequent adjustment of system-wide emission caps are discussed in NRTEE Issue Paper 8, and issues related to the allocation of allowances under the cap to individual participants in the system are discussed in NRTEE Issue Papers 6 and 7.

In a credit trading program, the strongest incentive to seek out greenhouse gas emission reductions is provided by complementary policies that require participants to reduce their GHG emissions. Such regulations can take several different forms, including emissions performance standards, energy efficiency standards, emissions caps, or requirements for new or expanding sources to offset their emissions with emission reductions from existing sources. NRTEE Option 8 describes a credit trading system that uses regulated performance standards to provide a demand for GHG emissions reduction credits.

In the absence of a complementary regulatory policy, an incentive could be provided by a clear government commitment to recognize emissions reduction credits as counting towards compliance with potential future regulatory obligations. This is, however, clearly a much weaker incentive for the creation and purchase of greenhouse gas emissions reduction credits. After all, such a commitment, even if enshrined in policy or law, would not legally bind future governments.[2] NRTEE Option 1 describes a credit trading system that relies on this weaker incentive to provide a demand for GHG emissions reduction credits.

Of course, the incentive provided by the regulatory backdrop to an emissions trading system will only be effective if the regulation is enforced and there are penalties for non-compliance. After all, if polluters can exceed regulated emission levels by either a small or large amount without facing a penalty, bona fide credits and allowances will be devalued. While the issue of non-compliance is discussed briefly in NRTEE Issue Paper 8, it is discussed in somewhat more detail in the following paragraphs.

Canadian environmental enforcement officials have a much more limited repertoire of enforcement responses than their counterparts in the United States. The main enforcement tool is prosecution in the criminal court system, a process that is too cumbersome, time-consuming and often inappropriate for minor violations of an emissions trading program.[3] Ticketing, where it is available, is much less cumbersome, but the quantum of ticket fines is limited,[4] and fines cannot be varied to recover profits.

Nonetheless, there are a number of alternative approaches that can be considered.

1. Allowance Trading Systems — Automatic Penalties: Creating an effective enforcement threat may involve changes to the tools of enforcement. In an allowance trading system (NRTEE Options 4, 11, 13 and 14), automatic penalties may provide very effective incentives for compliance. Under the U.S. Clean Air Act Title IV Acid Rain Program, utilities are required to pay a fine of US$2,000 (in 1990 dollars) plus an allowance for one short ton of

2 Government policy cannot fetter future governments, and legislation can be amended by future legislatures or parliaments. Whether or not reneging on a promise to recognize credits would give rise to legally enforceable claims for compensation is beyond the scope of this paper.

3 See Christopher Rolfe, "Administrative Penalties: A Tool for Ensuring Compliance," paper prepared for the Canadian Council of Ministers of the Environment, Winnipeg, February 11, 1997, available at West Coast Environmental Law Web site; L.S. Fairbairn, "Regulatory and Quasi-Regulatory Offences: Should They Be Included in the Criminal Law?" unpublished paper presented to the Conference of the Society for the Reform of Criminal Law, June 28, 1993.

4 See Fairbairn, ibid.

sulphur dioxide (SO_2) emissions for every ton or fraction of a ton by which a utility exceeds its allowable limit. The fine is imposed whether or not the utility was negligent in allowing the exceedance to occur. Without government having taken any enforcement action, a utility will be subject to a further fine if it does not pay within a certain required time. All participants have been in full compliance since the program was launched in 1995.

While such a system of automatic penalties could work with any monitoring system, it may be more acceptable if sources are required to install automatic, tamper-proof monitoring systems such as the continuous emission monitoring systems and fuel meters mandated by the Title IV Program. Credible monitoring data diminish the validity of potential claims that the non-compliance was solely due to error or uncertainty in the monitoring system and hence that the non-compliance should not be penalized.

2. Credit Trading Systems — Discretionary Administrative Penalties: Automatic penalties may also have a place in a credit trading system, but credit trading also requires a discretionary administrative penalty system. Administrative penalties are penalties imposed by government tribunals or officials rather than the courts. They are the primary enforcement tool for environmental laws in the United States and have been used by several provinces for environmental offences.

Administrative penalties involve neither the criminal court system nor the risk of jail, and are thus not usually subject to the constitutional protections applicable to criminal prosecutions.[5] Proof of a violation is on the "balance of probabilities" rather than "beyond a reasonable doubt," the onus of proof can be shifted to the alleged violator, and due diligence is not necessarily a defence. Administrative penalties are also especially important because a tribunal of experts rather than a provincial court judge can be tasked with reviewing the validity of credits. While the fines under administrative penalty regimes are usually lower than for traditional offences, they can be more structured. For minor violations, administrative penalties can have significantly greater deterrent value than penalties for regulatory offences. This is because they are more likely to be applied, can be applied more rapidly, are more likely to result in a fine, and the fine is more consistent.[6]

Giving enforcement staff the option of administrative penalties may allow for more efficient and effective enforcement action in the context of minor violations. However, increased staffing may also be needed to police credit trading systems, because inspections of multiple sites may be necessary to determine whether the credits used by one emitter are valid. For instance, to determine whether or not company X is in compliance with a performance standard, inspectors may not only need to inspect company X, but also the sources of its credits. These could include homes that have been retrofitted, a carbon sequestration site, and other plants. Enforcement staff in most provinces have been cut back in recent years, while the number of regulations being enforced has climbed.

Credit trading may also necessitate a number of minor changes to the enforcement regime. For instance, legislative changes may be needed to:

5 Ibid.

6 Environment Canada, *Administrative Monetary Penalties: Their Potential Use in CEPA.* (Number 14 of the Reviewing CEPA, the Issues Report series, 1994).

- give inspectors the authority to inspect the operations and records of credit creators and guarantors;[7]
- certify credit auditors and require third party audits of credits; and
- ensure that current statutory limitations on prosecutions do not block enforcement action related to credits that have been generated long before use.

Policies That Ensure the Integrity of an Emissions Trading System

Rules regarding property and ownership are essential elements of any market. An emissions trading system requires:

- clear rules of ownership for emission reductions and allowances; and
- clear rules of liability regarding the validity and sufficiency of emission reduction credits.

These issues are also addressed in NRTEE Issue Paper 8, so only an overview is presented here.

Under an allowance trading program, government allocates allowances to firms or individuals, and ownership is determined by common or civil law rules of ownership.[8]

The common law rules that govern ownership of everything from land to intellectual property, however, do not provide a clear answer to who has property in emission reduction credits. This means multiple parties could claim ownership of an emission reduction, potentially leading to multiple credits being generated by the same reduction. For instance, homeowners, the electric utility and retrofitters might all seek to claim ownership of an emission reduction achieved through a utility-sponsored home retrofit program.

A credit trading program could simply require all parties to agree to a particular share of ownership in emission reductions. However, this would allow parties that have made no investment in the emission reduction measure to extract "economic rent" from the parties that have invested in the reduction. This in turn could make cost-effective emission reduction measures less attractive. Rules regarding who has prima facie ownership of emission reductions are necessary for an effective credit trading program. Once prima facie ownership is established, standard commercial law can govern the sale of reductions or portions of reductions.

Emissions trading systems also require clear rules regarding liability for various transactions. Again, these rules are typically straightforward in an allowance trading system (buyers can purchase allowances without regard to whether the allowance is surplus to the sellers' needs). Liability is not, however, as straightforward in a credit trading system. Different credit trading systems have different rules for liability. Those rules should be designed to create incentives for compliance by credit creators, credit users and third party guarantors, brokers and aggregators.[9]

7 These inspection powers are typically absent from current legislation. See, for instance, section 21 of the B.C. Waste Management Act and section 100 of the Canadian Environmental Protection Act.

8 The status of allowances as legal property, for which compensation is payable in the event they are cancelled, or revocable licences, for which compensation is not payable, is less certain. See Chris Rolfe, *Turning Down the Heat: Emissions Trading and Canadian Implementation of the Kyoto Protocol*, West Coast Environmental Law Research Foundation, Vancouver, 1998, p. 251.

9 Further discussion of liability issues can be found in Chris Rolfe, ibid., pp. 207-212; and United States, Environmental Protection Agency, "Open Market Trading Rule for Ozone Precursors, Proposed Policy Statement and Model Rule," *Federal Register*, July 16, 1995, pp. 18-28.

Complementary Policies that Remove Barriers to the Implementation of Cost-effective Emission Reductions

> *The degree to which technical potential and cost-effectiveness are realized depends on initiatives to counter lack of information, and overcome cultural, institutional, legal, financial and economic barriers that can hinder diffusion of technology or behavioral changes.*
>
> — Intergovernmental Panel on Climate Change, Working Group II[10]

Bottom-up analyses of the costs of reducing greenhouse gas emissions typically conclude that there is significant potential for emission reductions at no net cost to society.[11] Nonetheless, it is also clear that much of this cost-effective emissions reduction potential is not being implemented. This gap between cost-effective emission reduction potential and actual investments in action to reduce GHG emissions is explained by the existence of various barriers.

Emissions trading systems, by generating market signals that provide a new incentive to reduce greenhouse gas emissions, can help to close this gap. At the same time, however, a number of the barriers to cost-effective investments in GHG emissions reduction will not be addressed by emissions trading. If these barriers are not addressed, an emissions trading system will not operate to its full potential. Some of the barriers that can potentially limit the effectiveness and efficiency of a domestic emissions trading system for greenhouse gases in Canada include:

- **Subsidies:** Subsidies include both direct subsidies — guarantees to reduce the risk of investment in high-risk projects — and imbalances in the tax system. For example, a 1996 study[12] found that Canada's current taxation regime favours investments in new fossil fuel energy supply projects over investments in energy efficiency when compared to a simpler, more neutral tax system.[13] Such subsidies can decrease the effectiveness of an emissions trading system by providing incentives that contradict and counteract the price signals generated through emissions trading.
- **Information Barriers:** It has been demonstrated that firms and individuals often do not invest in greenhouse gas emissions reduction because they are unaware of the potential cost savings, and because suppliers of energy efficient and other GHG emissions reducing technologies are unfamiliar with how to market their products. This can decrease the effectiveness of an emissions trading system because firms cannot respond to the price signal generated through the system if they do not have information on GHG emission reduction opportunities.
- **Financial Barriers:** Consumers and businesses are often unwilling or unable to make the capital investments required to implement energy efficiency initiatives and other greenhouse gas emission reducing actions that cut costs in the

10 Intergovernmental Panel on Climate Change, Working Group II, "Summary for Policymakers: Scientific-Technical Analyses of Impacts, Adaptations, and Mitigations of Climate Change," in *Climate Change 1995, Impacts, Adaptations and Mitigation of Climate Change: Scientific-Technical Analyses*, Contribution of Working Group II to the Second Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, London, 1996, p. 12.

11 It should be noted that in reducing net costs to society, a firm's compliance costs may not always be minimized.

12 Finance Canada and Natural Resources Canada, *The Level Playing Field: The Tax Treatment of Competing Energy Investments*, Ottawa, September 1996.

13 Since 1996, some changes have been made in the tax system that begin to address the concerns raised by the *Level Playing Field* study, for example, a new category of expenses for certain types of energy projects that can be fully deducted or used with flow-through shares (Canadian Renewable and Conservation Expense). These changes, however, have been modest and more could be done to eliminate differential treatment.

long run. The rate of return required by one firm may be far higher than that required by another firm for an investment with equal risk. The market signals sent by emissions trading may allow more projects to meet a firm's rate of return requirements, but emissions trading systems are unlikely to change those requirements or to address problems firms may face in gaining access to the capital required to proceed with climate friendly investments.

- **Externalities:** The costs to the consumer of energy and products or services that use energy do not incorporate "externalized" social and environmental costs, such as the environmental and health impacts associated with the emissions produced through fossil fuel combustion. While an emissions trading system begins to incorporate climate change considerations into market signals, the environmental impacts of the combustion of fossil fuels extend far beyond climate change. As a result, an emissions trading system will not address all the externalities that should be considered by firms and individuals when making choices that will ultimately have an impact on greenhouse gas emissions. This means that some cost-effective emission reduction opportunities will continue to be ignored unless other policies (e.g., regulations) are being used to address the environmental impacts of other pollutants.
- **Institutional Barriers:** In some cases regulations or the way a business is organized may inhibit cost-saving investments in greenhouse gas emissions reduction. Institutional barriers can also include "institutional cultures" within government and industry that see large energy intensive projects as more attractive than energy efficiency. While the implementation of an emissions trading system may help reduce these barriers, they are often well entrenched and difficult to dislodge.

Clearly, there are many barriers that need to be addressed by complementary policies if an emissions trading system is to operate at maximum efficiency and with maximum effect. It is also true, however, that the establishment of a domestic emissions trading system in Canada will help to overcome some barriers that currently block implementation of cost-effective actions to reduce greenhouse gas emissions.

For example, an open credit trading system (NRTEE Option 8) or an allowance trading system that includes municipalities as participants (NRTEE Option 14) will provide incentives for municipalities to adopt measures, such as more stringent building codes and full cost transportation planning, that help remove barriers to greenhouse gas emissions reduction. At the same time, an allowance trading system based on the carbon content of fossil fuels (NRTEE Option 4) may cause a partial internalization of air pollution costs (assuming a rough correlation between fossil fuel carbon content and air emissions) in the costs of energy services provided by fossil fuels.

Nonetheless, it is clear that a domestic emissions trading system for greenhouse gases will not address all barriers that block the implementation of cost-effective emission reduction actions in Canada. As a result, complementary policies are required to address such barriers and therefore improve the economic efficiency of an emissions trading system by reducing the net cost of meeting emission reduction targets.

What are some of these complementary policies? While an exhaustive list is beyond the scope of this paper, a number of potential policies are discussed below.

Utility Demand Side Management

Much of our experience with efforts to address barriers and cure market failures comes from utility demand side management (DSM) programs. DSM

refers to a broad range of policies that are based on the philosophy that one can tackle projected increases in demand for utility services through specific policies that seek to decrease demand rather than specific policies that seek to increase supply. Examples of DSM policies for utility customers include subsidies for the purchase of energy efficient equipment, information and education programs related to energy efficiency, more finely tuned pricing strategies (e.g., tied to time of day) and programs that purchase equipment that is energy inefficient and take it out of the marketplace.

In the last decade, more than 2,000 demand side management programs have been operated by over 500 utilities.[14] These programs have been mandated by utility commissions interested in ensuring that customers' needs for heat, light and other energy services are met at the lowest financial cost and least environmental damage. The costs of North American electric DSM programs have ranged from $0.001 per kilowatt hour (kWh) saved to $0.25 per kWh saved.[15] Competitive bids for reducing electricity demand suggest that the cost for improving energy efficiency is in the range of $0.04 to $0.07 per kWh, decreasing over time.[16] This compares to consumer prices for electricity of around $0.07 per kWh.

Although cost-effective in reducing costs per unit of energy services, DSM increases costs per unit of energy. This, in combination with the freedom of consumers to switch suppliers, may make DSM less feasible in the context of a deregulated electricity market. New approaches to delivery of DSM may be necessary. This should be explored both in utility markets, where there is a long history of DSM, and in other sectors like transportation where far less effort has gone into removing barriers to cost-effective greenhouse gas emissions reduction.

Emissions trading systems that require utilities to be responsible for the emissions associated with their customers' use of energy services and place a cap on those emissions (NRTEE Options 11, 13 and 14) may provide an incentive for the implementation of DSM programs. This incentive is not likely to be very strong, however, under an upstream carbon content emissions trading system (NRTEE Option 4). Utilities may pursue DSM under a credit trading system (NRTEE Options 1 and 8), if DSM programs can produce greenhouse gas emission reductions more cost-effectively than other possible actions. When an emissions trading system does not encourage DSM to occur, it would be a useful complementary policy to implement independently.

Land Use Planning and Transportation Infrastructure

Today's investments in the capital stock of transportation infrastructure and today's decisions regarding land use planning will affect greenhouse gas emissions for the next 50 years to a century or more. Once these investments are made they are difficult to reverse except through the natural retirement of the capital stock. Prematurely retiring capital stock such as freeways is enormously expensive.[17]

An emissions trading system provides a market signal that causes investors to begin to incorporate climate change considerations into their investment choices. The cost-effectiveness of measures that affect urban form, however, will depend to a large extent on the

14 Steven Nadel, Miriam Pye and Jennifer Jordon, American Council for Energy Efficient Economy, "Achieving High Participation Rates: Lessons Taught by Successful DSM Programs," in *Collaborative Committee for the 1991-1994 Conservation Potential Review Electricity Conservation Potential Review, 1988-2010: Phase II — Achievable Conservation Potential through Technological and Operating Change*, BC Hydro, Vancouver, 1994.

15 Ibid.

16 Joel Swisher, "Regulatory and Mixed Policy Options for Reducing Energy Use and Carbon Emissions," in *Mitigation and Adaptation Strategies for Global Change*, Kluwer Academic Publishers, The Netherlands, 1996, p. 37.

17 Mark Jaccard, Simon Fraser University, School of Resource and Environmental Management, "Heterogeneous Capital Stocks and Decarbonating the Atmosphere: Does Delay Make Cents?" (1997).

discount rate applied to the value of future emission reductions. Real financial discount rates of 10% or more will quickly turn the value of future reductions into negligible amounts. As a result, the market can fail because of the huge discrepancy between market evaluation of the value of future emission reductions and social evaluation of the value of future emission reductions.

This can only be addressed in an emissions trading system if the municipal governments responsible for urban infrastructure are also held responsible for emissions generated by transportation within their jurisdiction. This is the case in NRTEE Option 14. In other cases, however, even if transportation emissions are addressed by the trading system (NRTEE Options 4, 11 and 13), the market signal sent by the emissions trading system will not be enough to have a significant influence on municipal governments' infrastructure planning. As a result, the direct incorporation of climate change considerations into planning processes such as community energy management, environmental assessment, regional growth planning and transportation planning is a useful complement to most emissions trading systems.

Information, Education and Outreach

While all emissions trading systems provide an incentive to take actions that reduce emissions, individuals and firms will only be able to take such actions if they are well informed about opportunities to reduce emissions. As a result, information, education and outreach programs are an important complement to any emissions trading system.

Such programs can communicate the benefits of less carbon-intensive technologies or practices and thus increase market acceptance. Within Canada, Natural Resources Canada has focused much of its effort on education and information programs. These information programs have largely centred on the residential and passenger transportation sector. Although there have been some notable success stories in these sectors,[18] information programs by themselves generally do not appear to stimulate significant changes in technology or practices.[19] They may, however, complement other approaches. They will tend to work better where energy prices are higher.[20]

The environmental effectiveness of information, education and outreach programs is difficult to assess, mostly due to limited information.[21] Early reviews of Canada's appliance labelling program showed that few consumers read the labels.[22] Similarly, most of the public appear to be unaffected by a Natural Resources Canada program intended to encourage the driving public to consider fuel efficiency in driving, maintaining and purchasing vehicles.[23] In some cases, effectiveness of programs has been reduced by poor cooperation of essential players. For instance, surveys indicated that car dealers were removing most of the labels under Natural Resources Canada's voluntary vehicle fuel

18 See Paul C. Stern, "What Psychology Knows about Energy Conservation," *American Psychologist* 47:10 (October 1992), p. 1228.

19 Joel Swisher, "Regulatory and Mixed Policy Options for Reducing Energy Use and Carbon Emissions," in *Mitigation and Adaptation Strategies for Global Change*, Kluwer Academic Publishers, The Netherlands, 1996.

20 William Kempton, John M. Darley and Paul C. Stern, "Psychological Research for the New Energy Problems: Strategies and Opportunities," *American Psychologist* 47:10 (October 1992), pp. 1213-1217.

21 Steven Nadel, Miriam Pye and Jennifer Jordon, American Council for Energy Efficient Economy, "Achieving High Participation Rates: Lessons Taught by Successful DSM Programs," in *Collaborative Committee for the 1991-1994 Conservation Potential Review Electricity Conservation Potential Review, 1988-2010: Phase II — Achievable Conservation Potential through Technological and Operating Change*, BC Hydro, Vancouver, 1994.

22 Paul C. Stern, "What Psychology Knows about Energy Conservation," *American Psychologist* 47:10 (October 1992), p. 1228.

23 In a 1994 Natural Resources Canada survey on the awareness of the motoring public, nearly 70% of respondents stated that they had not heard any information on how to improve road transportation and fuel efficiency. Natural Resources Canada, "Improved Fuel Efficiency in Road Transportation and Advanced Technology Vehicles," unpublished paper prepared for the Canadian Council of Ministers of the Environment, September 25, 1995.

efficiency labelling program.[24] Education and information may be significantly more effective in the industrial sector, where there is generally less demand for immediate payback from energy efficiency investments.[25]

Energy Auditing

Energy auditing, or pollution prevention planning with an energy component, may be effective in reducing both informational and institutional barriers to greenhouse gas emissions reduction. Energy audits or pollution prevention plans involve a detailed review of the processes used by facilities (inputs, outputs and operating practices), as well as a detailed evaluation of measures for decreasing the use of energy and/or the creation of polluting substances. Mandatory pollution prevention planning laws in 20 U.S. states are intended to force companies to rethink processes and products.[26] Other states provide regulatory incentives to firms that conduct pollution prevention planning or auditing. Several Canadian provinces have pollution prevention planning initiatives.

Canadian and U.S. experiences suggest that companies that audit their energy use find savings they did not expect. For instance, TransAlta Utilities encouraged energy audits of all its operations by applying an internal $2 per tonne carbon tax.[27] This motivation to find energy efficiency led to over a million tonnes of emission reductions, most of them profitable in the absence of the internal carbon tax. Early analyses of the U.S. pollution prevention planning experience suggest that despite an initially steep learning curve for industry and regulators, planning produces significant net savings.[28] Eighty percent of the energy-saving lighting upgrades under the Environmental Protection Agency's Green Lights Program (essentially a program of energy audits for lighting) had payback periods of two years or less.[29]

Energy Efficiency Standards

A domestic emissions trading program for greenhouse gases will begin to incorporate climate change considerations into market prices, but does nothing to internalize the costs associated with the other environmental impacts of fossil fuels. In the absence of measures that specifically internalize non-climate environmental costs, energy efficiency standards can be a useful complementary policy to an emissions trading system because they can help to internalize these costs, producing better price signals that allow markets to operate more efficiently.

Experience suggests that efficiency standards can be an effective policy instrument to improve energy efficiency. For example, the fuel efficiency of new cars roughly doubled from the time the United States introduced Corporate Average Fuel Efficiency (CAFE) standards — the equivalent of Canada's Corporate Average Fuel Consumption (CAFC) standards — in 1978 until they reached their present

24 Close to 75% of automobile dealerships received between 85% and 100% of vehicles from manufacturers with such labels affixed, but close to 39% of the dealerships surveyed by NRCan had no labels on the vehicles in their car lot and only 21% had labels on all the vehicles in their lot. Ibid., p. 5.

25 A comparison of scenarios for improving efficiency in British Columbia found that, for educational programs, the ratio of cost to energy savings was far higher in the industrial sector than other sectors. Steven Nadel, Miriam Pye and Jennifer Jordon, American Council for Energy Efficient Economy, "Achieving High Participation Rates: Lessons Taught by Successful DSM Programs," in *Collaborative Committee for the 1991-1994 Conservation Potential Review Electricity Conservation Potential Review, 1988-2010: Phase II — Achievable Conservation Potential through Technological and Operating Change*, BC Hydro, Vancouver, 1994, Table II-2, p. II-5.

26 Waste Reduction Institute for Training and Applications Research, Inc., "State Legislation Relating to Pollution Prevention" (WRITAR, April 1992), unpublished.

27 Personal communication with John Hastie, TransAlta Corporation, Calgary.

28 Ken Geiser, "Pollution Prevention and Waste Reduction Planning, A Quick Look at Initial State Experience," Massachusetts Toxic Use Reduction Institute, November 1992, unpublished.

29 Michael E. Porter and Claas van der Linde, "Green and Competitive: Ending the Stalemate," *Harvard Business Review* 120 (September-October 1995).

level in 1985; they have not improved significantly since then.[30] Nor did fuel efficiency improve in Europe, where no standards were in force.[31] The environmental benefits generated by the imposition of energy efficiency standards can be further enhanced by policies that increase the price of energy.

Experience with energy efficiency standards suggests that in addition to being environmentally beneficial, they can be cost-effective and produce savings for consumers. For example, U.S. energy efficiency standards for refrigerators have lowered energy use by as much as 60%; the total costs of the standards, including administrative overhead, are estimated as being under half the cost of the energy saved.[32] The cost of refrigerators has also dropped since the standards came into effect. It is estimated that much greater energy savings are possible with net cost savings to the consumer.[33]

Energy efficiency standards do have some inherent limitations. Minimum performance standards (such as those for appliances) tend to eliminate the least efficient products but do not encourage improvements in top-end products. In contrast, average performance standards, such as the CAFE standards for motor vehicles, encourage a shift to energy efficiency across the entire market. It is also true that if standards significantly affect product prices they may slow capital stock turnover to more energy efficient capital. They may also have a "rebound effect." For instance, for every 10% decrease in the price of driving due to improved fuel efficiency, car use will increase about 1.0% to 1.5% due to reduced costs per kilometre travelled.[34] Efficiency standards will thus be most effective where the demand for the energy-using services is relatively price inelastic.

How can energy efficiency standards internalize the costs associated with the other environmental impacts of fossil fuels? When such standards are created, their cost-effectiveness is assessed. If good data are available on environmental costs, these can be incorporated into the assessment. Even where specific information on environmental costs is not available, however, these costs can be approximated by applying an environmental multiplier to the energy prices used in determining the cost-effectiveness of the standards. The U.S. Environmental Protection Agency uses this approach in setting energy efficiency standards for appliances.

Procurement Programs

While emissions trading systems provide a strong signal to purchase greenhouse gas emissions reducing technologies, participants in the system will only be able to do this if such technologies are available in the marketplace. Technology procurement programs are therefore a useful complement to an emissions trading system, because they reduce manufacturers' and distributors' risks associated with the introduction of new technologies and products.

In some programs, government commits to directly purchase a certain number of new products; in other cases, government or other organizations organize buyers to purchase new technologies at costs that would be impossible without large orders. Often the products purchased under procurement programs enter the market with a price premium, but

30 Natural Resources Canada, "U.S. and Canadian Approaches to Vehicle Fuel Efficiency Standards," unpublished background paper for CCME Task Force on Cleaner Vehicles and Fuels, August 1995, pp. 9-10. Statistical analysis of fuel efficiency patterns strongly suggests that CAFE standards, not increased fuel prices, were the prime motivator behind better fuel efficiency.

31 Joel Swisher, "Regulatory and Mixed Policy Options for Reducing Energy Use and Carbon Emissions," in *Mitigation and Adaptation Strategies for Global Change*, Kluwer Academic Publishers, The Netherlands, 1996.

32 The price of refrigerators in real dollars has dropped. The estimate of the total costs of the standards is three cents per kWh saved (compared with a retail cost of at least seven cents). See Swisher, ibid.

33 Swisher, p. 29.

34 David L. Greene, "Vehicle Use and Fuel Economy: How Big Is the 'Rebound' Effect?" Oak Ridge National Laboratory, Oak Ridge, Tennessee, March 1991, unpublished.

sufficiently sized procurement plans have been successful in reducing the premium to near zero or lower.[35]

One of the best examples of procurement programs is the "Greenfreeze" program in Europe. In the early 1990s, European refrigerator manufacturers were reluctant to change to refrigeration technologies that were energy efficient and did not use ozone-depleting substances. Greenpeace was able to get one company to commit to the new technology if the company received sufficient pre-orders. Greenpeace then campaigned to get tens of thousands of pre-orders for the refrigerator, thus allowing the company to secure capital investment in the new technology. Since then, the alternative technology has become the norm among all European manufacturers. Other examples of successful procurement programs include programs for lighting ballasts, computers and windows.[36] On the other hand, procurement programs may be less successful where manufacturers are reluctant to prove a new technology's cost-effectiveness (for instance, because of the precedent it may set for regulation)[37] or where the new technology has higher initial costs and there is little appetite for increased capital expenditures.

Financial Incentives for Energy Efficient Equipment

While an emissions trading system should make investments in greenhouse gas emissions reduction more attractive, some cost-effective investments will still not take place because of industrial, residential or commercial consumers' lack of access to capital, or resistance to investing scarce capital for long-term energy cost savings. For example, financially strapped consumers are usually unwilling to go into debt for energy efficiency investments, even when their return on investment may be higher than the interest they pay. Also, different consumers have dramatically different requirements as to reasonable payback periods. Individual consumers have been shown to demand a payback on energy efficiency investments of less than one year, commercial operations two to three years, and industrial consumers three to five years.[38]

Policies that address these barriers can be a useful complement to an emissions trading system. A number of financial incentives have been identified or used to overcome these barriers, including mortgage rates that reflect decreased energy costs, accelerated capital cost allowances for energy efficiency investments, and rebates for energy efficient products. Although it is beyond the scope of this paper to examine all of these potential policies, some examples will be provided.

Both loan programs and rebates can make energy efficient equipment more attractive by lowering capital costs. Rebate programs appear to be more effective, especially among residential customers, who are generally unwilling to assume debt to save energy.[39] BC Hydro's Industrial Motors Program cost only $0.010/kWh saved, and its refrigerator rebate program cost only $0.013/kWh saved.[40] The Industrial Motors Program increased the market

35 Joel Swisher, "Regulatory and Mixed Policy Options for Reducing Energy Use and Carbon Emissions," in *Mitigation and Adaptation Strategies for Global Change*, Kluwer Academic Publishers, The Netherlands, 1996, p. 32.

36 Ibid.

37 Some commentators have suggested that procurement programs for alternative technology vehicles have been less effective because of the automobile industry's steadfast opposition to alternative technology mandates.

38 John Robinson et al., *Canadian Options for Greenhouse Gas Emission Reduction (COGGER)*, Canadian Global Change Program, Ottawa, 1993, p. 11; see also Joel Swisher, "Regulatory and Mixed Policy Options for Reducing Energy Use and Carbon Emissions," in *Mitigation and Adaptation Strategies for Global Change*, Kluwer Academic Publishers, The Netherlands, 1996, p. 34.

39 Swisher, p. 34.

40 Steven Nadel, Miriam Pye and Jennifer Jordon, American Council for Energy Efficient Economy, "Achieving High Participation Rates: Lessons Taught by Successful DSM Programs," in *Collaborative Committee for the 1991-1994 Conservation Potential Review Electricity Conservation Potential Review, 1988-2010: Phase II — Achievable Conservation Potential through Technological and Operating Change*, BC Hydro, Vancouver, 1994, p. 35.

share of efficient motors from 4% to 64% in four years, allowing BC Hydro to reduce rebate payments and impose even higher standards for qualifying motors.

Measures to Reduce Air Pollution or Realize Other Environmental Goals

A domestic emissions trading system for greenhouse gases facilitates investments in the most cost-effective emission reductions on the basis of dollars per carbon dioxide (CO_2) equivalent tonne. Climate change, however, is only one of the environmental impacts associated with the combustion of fossil fuels. An emissions trading system will not necessarily encourage the most cost-effective emission reductions when costs such as local air pollution and oil spills are internalized.

According to the Intergovernmental Panel on Climate Change, Working Group II, "Policies to reduce net greenhouse gas emissions appear more easily implemented when they are designed to address other concerns that impede sustainable development (e.g. air pollution and soil erosion)."[41] Failing to account for these other environmental impacts in market prices will diminish the efficiency of the emissions trading market and will mean that some cost-effective emissions reduction opportunities will be ignored.

Policies that internalize other environmental costs are a useful complement to an emissions trading program.[42] Such policies might include emission fees or emissions trading for local and regional pollutants. They could also include cost-effective prescriptive policies. Some policies that are routinely advocated to address other environmental problems but that also address climate change include vehicle inspection and maintenance programs, vehicle scrappage programs, programs to increase transit ridership, full cost road pricing, integrated resource planning, landfill gas recovery, improved manure storage and use, no-till agriculture, and increased perennial forage.

Additional air pollution protection may also be advisable to counter public concerns that greenhouse gas emissions trading will lead to concentrations of emissions in some areas. Although GHG emissions have no local impacts per se, trading may lead to shifts in production that cause local pollution to worsen in some areas. Increasing the stringency of air pollution regulations may help counter concerns related to such shifts.

Removing Subsidies

An emissions trading system that provides a market signal that encourages greenhouse gas emissions reduction will be less cost-effective if the tax system provides a subsidy or "uplift" that sends a contradictory market signal favouring carbon-based energy sources. Such policies are clearly not complementary to an emissions trading system and should be eliminated.

There is no doubt that such non-complementary policies exist in Canada. In 1996, the Department of Finance and Natural Resources Canada published a joint study comparing the tax treatment of various energy-related investments and expenditures.[43] The value of each expenditure or investment under our

41 Intergovernmental Panel on Climate Change, Working Group II, "Summary for Policymakers: Scientific-Technical Analyses of Impacts, Adaptations, and Mitigations of Climate Change," in Climate Change 1995, Impact, *Adaptations and Mitigation of Climate Change: Scientific-Technical Analyses, Contribution of Working Group II to the Second Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, London, 1996, p. 18.

42 In the same vein, internalizing costs other than environmental damage will also help ensure the efficiency of market instruments for GHG emissions. This may be particularly true in the transportation sector. For instance, estimates of the costs of motor vehicle transport not paid for by the driver range from 2% to 10% of GDP. These include costs of policing roads, the value of land used for roads, impacts on neighbouring lands, and health care costs associated with vehicle use.

43 Natural Resources Canada and the Department of Finance, *The Level Playing Field: The Tax Treatment of Competing Energy Investments*, Ottawa, September 1996.

current system was compared with its value under a neutral tax system that has no tax credits, tax exemptions or preferential tax rates.[44] The report concluded that:

- Investments in energy efficiency for commercial buildings — for instance, district heating, solar space heating or building retrofits — were less attractive (up to 10% less attractive in the case of retrofits) than they would be in a neutral tax system.
- Conventional oil and gas investments were 5% to 10% more attractive under the current system than a neutral system. In addition, oil and gas companies can transfer exploration expense write-offs to shareholders. This made a conventional oil and gas project up to 20% more attractive than it would be in a neutral tax system.
- Large oil investments such as oil sands projects and the Hibernia offshore development were made up to 21% more attractive by the current tax system.

Elimination of Canadian subsidies is complicated by the fact that the United States and other jurisdictions offer similar subsidies,[45] and regions dependent on fossil fuel exploration and development fear transfer of oil and gas development elsewhere. Ideally, subsidies would be removed in a coordinated manner.

Complementary Policies to Improve the Equity of a Domestic Emissions Trading System

An emissions trading system should allow greenhouse gas emission reductions to be achieved more efficiently at lower cost. Efficiency, however, is not the same as equity. An emissions trading system can lead to accumulations of wealth or the imposition of costs that are deemed to be unfair. This situation is not unique to emissions trading — any policy to reduce GHG emissions imposes costs that may be inequitably distributed. It does mean, however, that addressing equity concerns will require the use of complementary policies.

While totally distinct complementary policies (e.g., taxes, subsidies) can be implemented to address equity concerns, many equity concerns can be addressed in the design of the emissions trading system itself. After all, a cap and allowance trading system will create and distribute wealth among participants when allowances are distributed gratis to participants in the system. In a credit trading system, the establishment of baselines against which credits are created will create and distribute wealth among system participants.

It is possible, therefore, to address equity concerns in the design of an emissions trading system through choices made with regard to the allocation of allowances (or the use of revenue generated by the auction of allowances) or the establishment of baselines. This is possible because emissions trading programs, particularly allowance trading programs, enable the program designer to separate the distribution of the economic burden of reducing greenhouse gas emissions from the implementation of emission reduction measures.

44 The study measured the "uplift" given by the tax system. The uplift is equal to [(net present value of tax paid under neutral system – net present value of taxes paid under Canadian system) x 100]/net present value of capital investment.

45 See André de Moor, Institute for Research on Public Expenditure, and Peter Calamai, *Subsidizing Unsustainable Development, Undermining the Earth with Public Funds*, Earth Council, Costa Rica, 1996.

Of course, there are many different conceptions of equity. This paper will briefly examine two broad conceptions of equity: (a) equity in the distribution of wealth among participants in the system, and (b) equity in the distribution of costs among sectors of society. Within each area, a couple of examples will be used to illustrate how the designers of an emissions trading system can pursue equity through program design. More detailed discussion of these examples can be found in NRTEE Issue Paper 6 (issues surrounding the gratis distribution of allowances) unless otherwise noted.

Equity in the Distribution of Wealth among Participants in the System

1. Promoting Equity among System Participants over Time: Since greenhouse gas emissions are likely to be regulated for 50 to 100 years or more, intertemporal equity becomes a more important consideration than for any existing trading program.[46] This requires an allocation rule that changes the distribution of allowances over time to accommodate the changing population of sources.

The only way this can be achieved in a substance trading program, such as the carbon content of fossil fuels or hydrofluorocarbons (HFCs) with gratis allocation, is to change the distribution of allowances in response to changes in sales. Intertemporal equity in an emission rights trading program, such as CO_2 emissions by fossil fuel users or methane emissions from landfills with gratis allocation, can be achieved by changing the allocation rule such that allowances are distributed on the basis of output, input or actual emissions. In general, a rule based on output is likely to be more efficient than one based on input or actual emissions.

2. Promoting Equity within an Upstream Carbon Content Emissions Trading System with Gratis Allocation of Allowances (NRTEE Option 4): In this form of emissions trading system, 350 to 700 fossil fuel producers and importers would need to hold allowances equal to the carbon content of their fossil fuel sales in Canada. If the fossil fuel producers and importers have to buy the allowances because they are auctioned by government or distributed gratis to other groups, the prices of the fossil fuel products they sell will rise due to the cost of purchasing the allowances. If the allowances are distributed gratis to the fossil fuel producers and importers, the prices of their products will rise by the same amount even though they have not incurred any expense to acquire the allowances. This is because these producers and importers may still need to buy or sell allowances, and the marginal cost of an allowance will be the same as the cost of purchasing an allowance through an auction.

While the price impact is the same no matter how the allowances are distributed, the wealth impacts are significantly different. If allowances are distributed gratis, fossil fuel producers and importers receive a windfall profit as a result of the higher prices they obtain for their products with no increased costs. While this "profit" may be reduced by the need to purchase additional allowances, the result is clearly inequitable. As a result, it would be necessary to design the system such that any windfall profits that do occur are taxed back.

46 The importance of intertemporal equity for a trading program depends on the magnitude and speed of the emissions reduction. If emissions are to be reduced to zero over a period of a decade, intertemporal equity is less of a concern than if emissions are to be reduced by 20% over 50 years. It is expected to take a century or more to stabilize atmospheric concentrations of GHGs, so intertemporal equity is a more important issue than for any existing program.

Equity in the Distribution of Costs among Sectors in Society

1. Promoting Equity among Different Income Groups: Firms that participate in an allowance trading program shift the cost of allowances to their customers, employees, suppliers, shareholders and lenders. Suppliers and customers of intermediate goods shift the cost to their customers, employees, suppliers, shareholders and lenders. Ultimately the costs are borne by individuals in their capacities as consumers of different products, employees of particular firms, and owners of capital.[47] Most studies find that the impact of an allowance trading system is slightly regressive — low-income groups will face higher costs as a percentage of income.

Emissions trading system designers could address this inequity in one of three ways:

- distribute some or all of the allowances gratis to individuals, who would then be able to sell the allowances to system participants — compensating them for the costs they incur as a result of greenhouse gas limitations;
- distribute allowances through auction and then use the auction revenue to offset the adverse impact on low-income groups through changes to the personal income tax or goods and services tax; or
- tax any windfall profits of participants in the trading system (as might occur in an upstream carbon content allowance trading system) and use the revenue to offset the adverse impact on low-income groups through changes to the personal income tax or goods and services tax.

2. Promoting Equity among Specific Interest Groups: Limiting greenhouse gas emissions will have adverse impacts on activities that generate such emissions. Due to coal's relatively high emissions per unit of energy and the availability of substitute energy sources for many applications, coal producers and users appear to be particularly vulnerable. This is true regardless of the policies adopted to limit GHG emissions. Emissions trading system designers could address this equity concern in three ways:

- Allowances could be distributed gratis to coal mining companies. These allowances could be used to meet any regulated requirements they face to hold allowances (compensating them in part for the decreased value of their capital as a result of a climate protection policy) and any surplus allowances could be sold to provide additional compensation.
- Allowances could be distributed gratis to funds charged with facilitating adjustment by specific interest groups affected by the closure of coal mines, who could then sell the allowances to participants in the trading program and use the revenue to fund adjustment programs.
- Allowances could be sold through auction and some of the revenue raised could be used to fund similar adjustment programs.

There are many "equity" concerns that arise with the implementation of a greenhouse gas emissions reduction strategy and/or the implementation of a domestic emissions trading system for GHGs. A number of complementary policies (e.g., taxation, subsidies) could be used to address these concerns. It is important to note, however, that an emissions trading system allows a separation to be made between organizations that bear the economic burden of reducing GHG emissions and organizations that implement GHG emission reduction measures. This means that equity concerns can often be addressed through program design.

47 Some suppliers and owners of capital may reside in other countries, so Canada's policies to limit GHG emissions can affect individuals in other countries. Conversely, the policies adopted by other countries can affect Canadians.

Complementary Policies to Reduce Emissions from Sources Not Covered by a Domestic Greenhouse Gas Emissions Trading Regime

If Canada is to meet its greenhouse gas emission reduction obligations, it must allocate responsibility for meeting this target at a sub-national level among emissions sources. This will help emitters plan their emission reduction strategies, promote accountability, and ensure that all emitters understand how they are being treated relative to one another.

A domestic emissions trading program for greenhouse gases can play a critical role in the process of allocating responsibility for Canada's climate protection commitments. At the same time, however, it is unlikely to completely address this question. After all, a domestic emissions trading program is unlikely to cover all sources and sinks of greenhouse gases.

NRTEE Issue Paper 1 discusses the extent to which different types of emissions trading systems may be applicable to different sources and sinks of greenhouse gases. Even if all sources and sinks of GHGs are amenable to some form of emissions trading, however, it is likely that some sources will be excluded for administrative reasons — the costs of participating in an emissions trading system are judged to be too high relative to the emissions.

Moreover, the potential coverage of Canada's greenhouse gas emissions by emissions trading varies from potential system to potential system. This is illustrated by the six emissions trading system design options examined by the NRTEE, all of which address a different portion of Canada's GHG emissions.

While it is difficult to assess the potential coverage of the first credit trading option examined (NRTEE Option 1), it is likely that sources representing only a small percentage of Canada's total emissions will actually participate, although virtually all sources are theoretically eligible to participate. The quantity of emissions addressed by the second credit trading option considered (NRTEE Option 8) are completely dependent on system design, but could represent a large percentage of fossil fuel related emissions. Among the four allowance trading systems examined by the NRTEE (Options 4, 11, 13 and 14), coverage of fossil fuel related greenhouse gas emissions under the emission cap ranges from approximately 50% to almost 100%.

Federal and provincial energy and environment ministers have clearly stated that all sectors and regions should do their share to contribute to Canada's climate protection commitments, but no region or sector should be asked to bear an unreasonable share of the burden of mitigation actions. This is clearly a precondition for the political saleability of an emissions trading program — few are going to want to participate if they believe that other important sources of greenhouse gas emissions are not being required to contribute to Canada's commitments. Accordingly, there is a need for complementary policies that reduce emissions from sources not covered by the emissions trading regime.

The four allowance trading systems examined by the NRTEE all cover energy-related greenhouse gas emissions from major point sources and transportation. They vary, however, in their treatment of the residential, commercial and institutional sectors. An upstream carbon content emissions trading program (NRTEE Option 4) covers these sectors because the system caps the carbon content of fossil fuels that ultimately produce emissions in these sectors. NRTEE Option 14 also addresses these sectors because it makes municipal governments responsible for these emissions. The two remaining options (NRTEE Options 11 and 13) do not address emissions from the residential, commercial and institutional sectors. Accordingly, complementary

policies will be needed to control greenhouse gas emissions from these sectors in these emissions trading systems.

What complementary policies could be used to both reduce greenhouse gas emissions from the residential, commercial and institutional sectors as well as allocate to these emission sources some clear responsibility for meeting Canada's GHG emission reduction commitment? The education, information and outreach programs described earlier in this paper can help facilitate emission reductions in these sectors, but they provide no real certainty that emission reductions will occur. Accordingly, more stringent policies will be required.

There are three major categories of policies that could be used to reduce emissions in these sectors and promote accountability for greenhouse gas emissions reductions: regulations, emissions charges, and tax incentives or subsidies. These will be discussed in turn.

Regulations: Regulations can require emissions sources in these sectors to install specific controls or equipment or to meet mandated performance standards. While regulations are a useful tool for assigning greenhouse gas emissions reduction responsibility to these sectors, they do not control aggregate emissions very precisely and would need to be periodically adjusted to meet a specific emissions reduction objective. The most common form of regulation in these sectors would be energy efficiency standards for new buildings, building retrofits, equipment and appliances.

Emissions Charges: Charges on greenhouse gas emissions like carbon dioxide provide a clear incentive for sources to reduce GHG emissions. There is no guarantee that an emissions charge will generate a specific level of emissions reduction, but it can be periodically adjusted to ensure that it makes a specific contribution to Canada's GHG emission reduction commitments. The most commonly discussed emissions charge is a carbon tax; revenue generated by the tax is offset by equivalent reductions in other taxes (payroll taxes, sales taxes or income taxes).

Under NRTEE Options 11 and 13, for example, sources that participate in the emissions trading system (large point sources and refineries to cover the transportation sector) would be exempt from the tax. The tax could, however, be applied to sources that are too numerous to include in the emissions trading system (e.g., users of home heating fuels) but for whom good data on emissions or fuel use are available. Naturally, sources that are excluded from an emissions trading system because of difficulties and uncertainties in measuring actual emissions levels would have to be excluded from an emissions charge as well.

Tax Incentives or Subsidies: While emissions charges provide a negative incentive for greenhouse gas emissions reduction, tax incentives and subsidies can provide a positive incentive to meet the same end. Once again, these tools provide no certainty as to the quantity of emissions reductions, but adjustments can be made. Some examples of potential policies that could be introduced to address emissions from the residential, commercial and industrial sectors are lower mortgage rates for energy efficient homes, improved tax treatment for investments in energy efficiency, and rebates for the purchase of energy efficient appliances and equipment.

These types of policy instruments can also be applied to other sectors not covered by a domestic emissions trading program. For example, all four allowance trading options examined by the NRTEE cover at least a portion of transportation-related emissions, but it is possible to envision a domestic emissions trading system that would exclude the transportation sector. In this case, similar policies could be implemented, for example fuel economy standards for new vehicles, increased gasoline taxes, or rebates for the purchase of energy efficient vehicles.

It should be noted, however, that policy makers will have to make choices with respect to the treatment of most emissions sources. For example, in the area of transportation, policy makers can either include transportation-related emissions within an emissions trading system, or address the transportation sector through the use of complementary measures, or do both. When choosing the appropriate approach to take, policy makers can conduct a cost-benefit analysis of different policy options. Essentially, policy makers can estimate the marginal cost of emissions reductions within an emissions trading system that included transportation and contrast that with the cost per tonne of emissions reductions expected to be generated through other approaches (regulatory, charges, incentives).

As noted above, none of these complementary policy tools can guarantee that emissions from sources outside a trading system will be held to a specific level. Accordingly, it is likely that a greenhouse gas response strategy that addresses such sources will make use of a mix of these instruments and make adjustments as required to meet specific emissions reduction objectives.