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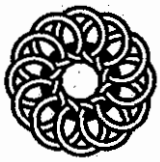

National Round Table on the Environment and the Economy
Table ronde nationale sur l'environnement et l'économie

What are the Implications of Calculating Greenhouse Gas Emissions on a Lifecycle Basis for the Design of Domestic Emissions Trading Systems?

Issue 10

Prepared for:

Multistakeholder Expert Group on Domestic Emissions Trading

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WHAT ARE THE IMPLICATIONS OF CALCULATING GREENHOUSE GAS EMISSIONS ON A LIFECYCLE BASIS FOR THE DESIGN OF DOMESTIC EMISSIONS TRADING SYSTEMS?

INTRODUCTION

This paper is one of a series of papers prepared for the NRTEE's Multistakeholder Expert Group on Domestic Emissions Trading related to issues that are relevant to the design of a variety of potential domestic emissions trading systems for greenhouse gases.

For emissions trading to work, it is clearly critical to be able to measure, monitor and verify total greenhouse gas emissions and/or the greenhouse gas emission reductions associated with a specific action. This requires agreement on the use of equipment that can directly measure emissions (e.g., continuous emission monitors) or agreement on the methodologies used to calculate emissions from other well documented data (e.g., fuel use).

It also, however, requires agreement on basic principles for determining how responsibility for greenhouse gas emissions should be allocated among different sources. At this time, there is a broad international agreement that an emissions source is responsible for all greenhouse gas emissions that are a direct result of its activities. For example, with regard to fossil fuel combustion, it is the source that actually combusts the fossil fuel that is responsible for the greenhouse gas emissions arising from the combustion of that fuel. This principle has been enshrined in the international guidelines for the preparation of greenhouse gas inventories developed by the Intergovernmental Panel on Climate Change (IPCC) and underpins all reporting under the United Nations Framework Convention on Climate Change.

Despite this broad international consensus, however, it is often argued that this accounting system is problematic. In Canada, the problem most often highlighted concerns the export of Canadian natural gas to the United States.

The production of natural gas is an energy-intensive process and Canada is currently responsible for all greenhouse gas emissions associated with its production, whether or not the gas is exported for use elsewhere. As a result, increased exports to the United States will increase Canada's total greenhouse gas emissions under current accounting procedures.[1] At the same time, however, the United States can use this natural gas to substitute for more greenhouse gas intensive goods and services (e.g., natural gas can be used to replace coal in electricity generation). As a result, such exports will decrease greenhouse gas emissions in the United States under current accounting procedures.

[1] More than 50% of Canada's natural gas production was exported to the United States in 1995. It has been estimated that 31% of the growth in Canada's greenhouse gas emissions between 1990 and 1995 was a result of increased natural gas exports to the United States (National Air Issues Coordinating Committee. Review of Canada's National Action Program on Climate Change, November 1996).

This has led some to argue that current international accounting procedures are unfair.[2] The argument states that Canada is being unfairly penalized because its greenhouse gas emissions have increased even though there has been no increase in the demand for final goods and services within Canada. In effect, the argument states that greenhouse gas emission reductions in the United States are being "subsidized" by greenhouse gas emission increases in Canada.[3]

One mechanism for addressing this concern is to use an alternative method to allocate responsibility for greenhouse gas emissions. This paper will examine one such method: accounting for greenhouse gas emissions on a lifecycle basis. It will begin by describing the concept and rationale of lifecycle emissions. It will then propose one partial application of this method with respect to greenhouse gas emissions and examine, to the extent possible, its implications for Canada's greenhouse gas emissions inventory. The paper will then go on to examine the implications of such an accounting system for the potential domestic greenhouse gas emissions trading systems being examined by the NRTEE.

WHAT ARE LIFECYCLE GREENHOUSE GAS EMISSIONS?

It is now broadly accepted that if you want to understand the full environmental impact of a good or service, you must examine all the environmental impacts generated by the good or service throughout its life. In other words, if you want to understand the full environmental impact of a product, you need to examine the environmental impacts associated with:

- the extraction of raw materials required to make the product,
- manufacturing of the product,
- transportation of the product from its manufacturing site to its end-use destination,
- use of the product, and
- disposal or recycling of the product.

Lifecycle thinking is important because it is often possible to take actions that will reduce the environmental impact of a product at one stage in its life while at the same time increasing the environmental impact of the product at another stage in its life. For example, the use of corn-based ethanol fuels produces fewer greenhouse gas emissions from automobile tailpipes, but many studies have shown that it may increase total

[2] The issue has been raised internationally by Canada with regard to natural gas exports and it has also been raised by Scandinavian countries in the context of electricity exports and imports. In the Scandinavian case, it is argued that a country can reduce its greenhouse gas emissions simply by substituting domestically produced electricity with imported electricity. This is a real issue in Scandinavia because of the interconnectedness of the electricity grid. Under current accounting practices, it is the exporting country that bears responsibility for the emissions associated with the production of that electricity. These concerns, however, have not been enough to alter the current international consensus on this issue.

[3] One of the main counter-arguments to this view is that Canada is in fact being paid for providing these goods and services. It is argued that in a market that has incorporated limits on greenhouse gas emissions into its price signals, Canadian producers would receive a premium for taking on responsibility for the greenhouse gas emissions associated with the production of natural gas for export.

greenhouse gas emissions on a lifecycle basis because the production of corn and its subsequent conversion to ethanol is an energy-intensive process.[4] It is only by taking lifecycle considerations into account that one can understand whether or not actions taken produce a net benefit for the environment.

Why might a lifecycle approach to greenhouse gas emissions accounting be attractive? Essentially, this accounting approach could provide:

- consumers with an understanding of the full environmental impact of their purchasing decisions, allowing them to make procurement decisions that represent the least possible greenhouse gas emission impact,
- organizations with the information they need to make technological choices that maximize greenhouse gas emission reductions from a lifecycle perspective, and
- governments with the information they need to develop an effective management strategy for the climate change issue both within Canada and internationally.

Can the concept of lifecycle emissions actually be applied to users of products and services that produce greenhouse gas emissions? To answer this question, we will restrict our discussion to the emissions generated by fossil fuels for energy purposes. Greenhouse gas emissions from other sources will not be considered in this paper.

APPLYING LIFECYCLE EMISSIONS CONCEPTS TO GREENHOUSE GAS EMISSIONS FROM FOSSIL FUEL COMBUSTION

A user of fossil fuels is already considered responsible for the greenhouse gas emissions produced as a result of his/her use of fossil fuels under current accounting practices. This 'use' also represents disposal as the fossil fuel is combusted during use.[5] It also, however, appears to be possible for users to calculate and be held accountable for the greenhouse gas emissions associated with the production and distribution of the fossil fuel energy sources they use.

For example, under current accounting practices, electricity generators are required to take full responsibility for the greenhouse gas emissions generated by the production and distribution of electricity. As electric utilities know both the amount of electricity and the total greenhouse gas emissions they have generated, they can calculate the carbon intensity of their electricity.

From the perspective of an electricity user, however, the carbon intensity of a specific electric utility is becoming of less and less importance. As electricity markets become more competitive, and more electricity producers enter the marketplace, a user of electricity increasingly has no idea which generators are producing the electricity being

[4] This is not true of all ethanol fuels. Lignocellullose ethanol fuels (produced from things like wood wastes and agricultural wastes) are seen to be a big winner on climate change from a lifecycle emissions perspective.

[5] Implications for potential domestic emissions trading systems of the use of fossil fuels for non-energy purposes are discussed in NRTEE Issue Paper # 5.

used. Accordingly, a user of electricity is now most interested in the carbon intensity of electricity being distributed on the grid.[6]

It is possible to determine the average carbon intensity of electricity distributed on the grid by month, season, or on an annual basis. Any electricity user should be able to match this emission factor with their electricity use in the appropriate period to determine the 'upstream' greenhouse gas emissions from electricity production and distribution they are responsible for. Indeed, many participants in Canada's Voluntary Challenge and Registry Program (VCR) already use this method to report such emissions in their annual submissions to the VCR. While this number will not be completely accurate (because of the use of average emission factors), this should not result in any double counting if all electricity users are calculating lifecycle emissions over the same time period and with the same emission factors.

The following Table presents Canada's greenhouse gas emissions in 1995 in two different formats from two different studies. The first, consistent with the IPCC, presents Canada's greenhouse gas emissions with electric utilities responsible for all greenhouse gas emissions associated with electricity production and distribution. The second presents Canada's greenhouse gas emissions with greenhouse gas emissions associated with electricity production and distribution parceled out among end users.

Table 1 – Canada's Greenhouse Gas Emissions in 1995 (MT)[7]

	No Allocation of Emissions From Electricity	Allocation of Emissions From Electricity
Residential	42.0	80.8
Commercial	27.2	52.4
Transport	165.0	162.4
Industry	189.8	224.0
Non-Energy	92.0	103.7
Electricity Generation	103.0	0
TOTAL	619.0	623.3

While it is possible for electricity users to calculate the 'upstream' emissions associated with their use of electricity, the issue is a bit more challenging when it comes to the direct use of fossil fuels by consumers. Under current accounting practices, the users of fossil

[6] In a competitive market, it will ultimately be possible for a user to sign a contract for electricity from a specific electricity supplier – for example to receive 50% of electricity from renewable energy sources. In reality, such a contract will only ensure that this electricity enters the grid and influences the average carbon intensity of the grid. The user will still need to know the carbon intensity of the entire grid to calculate upstream greenhouse gas emissions.

[7] The data in the first column is taken from "Trends in Canada's Greenhouse Gas Emissions: 1990-1995" (Environment Canada, April 1997), and the data in the second column is taken from "1996 Review of Canada's National Action Program on Climate Change (National Air Issues Coordinating Committee, November 1996). Differences in total emissions represent the fact that the official estimate of Canada's greenhouse gas emissions in 1995 was adjusted slightly in the time period between the two studies.

fuels are responsible for the greenhouse gas emissions produced in their combustion of those fossil fuels. To incorporate a lifecycle perspective, however, fossil users would also have to take on responsibility for the 'upstream' emissions associated with the production of those fossil fuels and add those emissions to the direct emissions resulting from fossil fuel use.

It has been estimated that the production and transmission of oil and natural gas by Canada's petroleum industry was responsible for 104.5 Mt of Canada's greenhouse gas emissions in 1995 – 16.8% of Canada's total greenhouse gas emissions.[8] This figure includes emissions from the direct combustion of fossil fuels by the petroleum industry as well as the emissions associated with the production and distribution of electricity used by the petroleum industry. It can be broken down by fuel type (e.g., oil, natural gas), general production process (e.g., oilsands production vs. conventional oil production vs. heavy oil production) and even on a company by company basis. This allows the greenhouse gas intensity of these different energy products, producers and production processes to be calculated.[9] On the other hand, it is difficult to obtain this information at a much more disaggregated level (e.g., oil well to oil well) where the greenhouse gas intensity of production can differ significantly. Moreover, it is difficult to trace oil and natural gas from production site to specific end use.

Like users of electricity, therefore, it appears that users of fossil fuels for energy purposes will also have to make use of average emission factors to estimate the upstream greenhouse gas emissions associated with their fossil fuel use. These averages are likely to be industry wide averages for energy products like natural gas, heating oil, gasoline, propane, etc, and this will be the assumption made for the remainder of this paper. While these numbers may not provide an accurate reflection of the upstream emissions associated with the fuel used by each specific user, they will provide an accurate reflection of aggregate upstream emissions if all users make use of a consistent set of emission factors.

It is also likely that similar upstream conversion factors can be developed for the production of coal and could be employed by users to get a more accurate picture of lifecycle greenhouse gas emissions associated with such products and services as the consumption of coal-generated electricity.[10]

It should be noted, however, that the argument for life cycle emissions can be extended even further. For example, all products (e.g., aluminum) contain 'embodied energy' that reflects all the energy used to produce the materials that make up the product, as well as the energy used in the manufacture of the product itself. As a result, full implementation of the lifecycle emissions concept would make users of products responsible for the

[8] 1996 Review of Canada's National Action Program on Climate Change.

[9] The Canadian Association of Petroleum Producers has already collected some of this disaggregated data and many individual companies have already begun to report data on the carbon intensity of their production processes to the Voluntary Challenge and Registry Program.

[10] It is only when the environmental impacts of the production of fossil fuels used to generate electricity are considered that one has a fully accurate picture of the lifecycle emissions associated with electricity generation.

emissions associated with the embodied energy contained in the product. It appears, however, that applying the lifecycle emissions concept to this degree becomes much more methodologically and administratively challenging. As a result, this possibility will not be the focus of this paper.

While embodied energy poses a serious problem, there appear to be no major methodological difficulties that would stand in the way of fossil fuel energy users taking on responsibility for the upstream emissions associated with the production and distribution of those fuels through the use of industry average emission factors. There are, however, some practical difficulties.

As noted earlier in the report, internationally accepted greenhouse gas emission accounting practices do not follow the lifecycle emissions concept.[11] While there appear to be no major methodological difficulties with adopting such a concept internationally with respect to the combustion of fossil fuels, this has not yet occurred. This poses two significant problems for the application of this concept in Canada.

First, a significant portion of Canada's fossil fuel and electricity consumption is imported from other countries. To make the lifecycle emissions concept work, it would be necessary to know the upstream emissions associated with the production and distribution of these fuels. This data is not yet readily available, but some efforts are already underway to develop it. For example, the Canadian Association of Petroleum Producers is working to determine the relative carbon intensity, on a lifecycle basis, of oil produced in Canada and oil produced in competing countries like Venezuela. Nonetheless, these efforts remain at an early stage and it will be difficult to have full confidence in data obtained from other countries until new internationally accepted inventory protocols are developed for the calculation of emissions on a lifecycle basis.

Second, a significant portion of Canada's fossil fuel and electricity production is exported to other countries. Under a lifecycle emissions accounting system, energy users in the importing countries would take on responsibility for the upstream emissions associated with the production and distribution of these fuels in Canada. If, however, lifecycle emissions concepts have not been adopted internationally these emissions will remain the responsibility of Canada – even though no one would be responsible for them under a domestic lifecycle emissions accounting framework. This means that if Canada was to meet an international emission reduction commitment, other emission sources would have to reduce emissions further to compensate for these 'unclaimed' emissions.

These are significant issues – issues which make the unilateral implementation of lifecycle emissions accounting a non-starter in a world where Canada is committed to meeting greenhouse gas emission reduction commitments determined through a competing accounting system. Nonetheless, for the purposes of this paper, we will assume that lifecycle emissions accounting has been adopted internationally. If that were

[11] This is true for all products. For example, emissions associated with the production of aluminum are the responsibility of the aluminum producer, not the aluminum consumer.

the case, what would be the implications for the domestic emission trading systems being examined by the NRTEE?

IMPLICATIONS OF THE LIFECYCLE EMISSIONS CONCEPT FOR POTENTIAL DOMESTIC GREENHOUSE GAS EMISSIONS TRADING SYSTEMS

This paper will now examine the implications of applying the lifecycle emissions concept to the six potential domestic greenhouse gas emissions trading systems being considered in the NRTEE process. Specifically, we will assume that greenhouse gas emission accounting procedures have been changed to ensure that users of fossil fuel based energy are responsible for:

- direct emissions associated with their own combustion of such fuels, and
- 'upstream' emissions associated with the production and distribution of these energy sources (fossil fuels and fossil fuel fired electricity).

The NRTEE process is examining six potential domestic greenhouse gas emission trading systems in detail. Two of these systems are credit trading systems.[12] The remaining four systems are allowance trading systems, one of which is based on the carbon content of fossil fuels rather than greenhouse gas emissions.[13]

Credit Trading

In credit trading systems, greenhouse gas emission reduction credits are created when a specific action is taken that results in greenhouse gas emissions being lower after the action was taken than would have been the case if the action had not been taken. The difference between these two scenarios is the greenhouse gas emission reduction credit. While organizations may want to use such credits to meet voluntary objectives (NRTEE Option 1), it is likely that significant demand for such credits will only develop when they can be used to help meet a mandated standard or other regulatory objectives (NRTEE Option 8).

Incorporating lifecycle greenhouse gas emissions accounting into a credit trading system implies that different methodologies will have to be used to create both the regulatory regime underlying the system and to calculate the greenhouse gas emission reduction credits. For example, the regulatory underpinning of the credit trading system could be provided by such things as a cap on total emissions from a source, or standards that establish a maximum level of emissions per unit of output from a source. These caps and standards would have to reflect lifecycle greenhouse gas emissions. In addition, the 'baseline' (without action) and 'with measures' scenarios used to determine the level of

[12] See NRTEE Options 1 (Voluntary Credit Trading) and 8 (Voluntary Credit Trading with Mandatory Performance Standards.

[13] See NRTEE Options 4 (Cap on Carbon Content of Fossil Fuels Produced and Imported), 13 (Cap and Allowance Trading), 11 (Cap and Allowance Trading and Domestic Credit trading), and 14 (Cap and Allowance Trading, Including Municipalities, and Domestic Credit Trading).

greenhouse gas emission reduction credit would have to be established on a lifecycle emissions basis. While not impossible, this would clearly be more difficult than establishing and operating a credit trading system using current accounting procedures.

If data are available to estimate upstream greenhouse gas emission factors, adoption of such an accounting system should not pose any methodological difficulties for a credit trading system. It does, nonetheless, have other implications. For example, under NRTEE Options 1 and 8, fossil fuel producers, importers and distributors are assumed to be organizations that will have a keen interest to purchase greenhouse gas emission reduction credits to help them meet either voluntary or regulatory obligations or objectives. In this system, however, fossil fuel energy producers, importers and distributors are not responsible for any greenhouse gas emissions under a lifecycle emissions accounting regime – all responsibility for emissions has been shifted to the users of these fuels. This means that fossil fuel users are likely to be the ones with an incentive to seek out greenhouse gas emission reduction credits to help them meet regulatory obligations under a lifecycle emissions accounting system.

As fossil fuel users become more familiar with lifecycle emissions concepts, however, they may start to make procurement decisions that favor producers and distributors of fossil fuels of lower carbon intensity. If upstream emission factors are industry averages, the purchase decisions of individual energy users has negligible impact on the average upstream emissions. So the users have little incentive to purchase low-emission fuels and producers have little incentive to reduce their emissions.

On the other hand, if upstream emission factors were calculated on a firm by firm basis, users would have a very strong incentive to seek out less carbon intensive producers. As noted earlier, however, it is more likely that industry average emission factors will have to be used because of the difficulty of tracing fossil fuel production to a specific end use.

Is there any scenario under which a fossil fuel producer, importer or distributor might seek to create credits by reducing the emissions associated with its own activities? This depends on how the lifecycle emissions are being calculated. If lifecycle emissions are being calculated on a firm by firm basis, any action taken by a fossil fuel producer, importer or distributor to decrease emissions will change the emission conversion factor and will automatically decrease the greenhouse gas emission inventories of the users of that fossil fuel. As a result, no credit can be created without double-counting. But, a fossil fuel producer or importer would have an incentive to take such actions anyway to enhance its competitive position in the marketplace.

The risk of double counting is diminished if industry average conversion factors are used, but it is still a strong possibility. Since industry average emission factors are likely to be relatively stable, they are likely to be based on actual data for the previous year. If a producer or importer was allowed to create a credit it would need to demonstrate a reduction from a baseline. That baseline would need to be used in calculating the emissions factor for the next (or next several) years to avoid double counting. Adjusting

the actual data for a large number of credit baselines in a way that protects against double counting would be methodologically challenging.

In conclusion, under a lifecycle emissions accounting system based on industry or gird-wide emission conversion factors, fossil fuel producers, importers and distributors would have little incentive to either create emission reduction credits within their own operations or to purchase emission reduction credits. The use of firm specific upstream emission conversion factors provides a strong incentive for these companies to purchase credits, but little incentive for them to create such credits within their own operations. Because upstream greenhouse gas emissions associated with the oil and gas industry account for 16% of Canada's total greenhouse gas emissions, the potential scope of credit trading would be reduced in a lifecycle emissions accounting context, making this form of emissions trading less effective.

Cap and Allowance Trading

Similar issues arise for greenhouse gas emission allowance trading systems. Under an allowance trading system, an emissions cap is established for a set of sources of greenhouse gas emissions and each of the sources is then allocated allowances to emit a portion of the total emissions cap. At the end of the compliance period (usually a year) all sources must hold allowances equal to the amount of emissions they have produced. If emissions are greater than allowances held, the source will have to purchase additional allowances to be in compliance with the regulation. Under a lifecycle emissions accounting system, actual emission levels would have to be calculated on lifecycle principles.

NRTEE Options 11, 13 and 14 apply emission caps to both producers and consumers of fossil fuels equivalent to the amount of emissions produced by the combustion of fossil fuels within their own operations. Under these systems, the only way users of fossil fuels can receive a signal about the lifecycle implications of their consumption is if caps on producers of fossil fuels lead to price increases that are passed on to consumers and provide an incentive for lower consumption. While this signal is real, it is not clear.

Under a system based on lifecycle greenhouse gas emissions accounting for fossil fuel based energy sources, emissions caps would only cover users of fossil fuels, not the producers, importers or distributors of those fuels. These caps would require users to hold allowances for greenhouse gas emissions associated with their combustion of fossil fuels as well as emissions generated by the production and distribution of those fuels.

Incorporating lifecycle emissions accounting into any of NRTEE Options 11, 13 and 14 would therefore result in the following changes to the scope and comprehensiveness of the trading system:

1. It would remove fossil fuel producers, importers and distributors from the system, although a portion of the emissions produced by these sources would become the responsibility of the fossil fuel users participating in the program.

2. It would increase the number of sources required to participate in the program to meet any given environmental objective because there are more users of fossil fuels than importers and producers of fossil fuels. For example, NRTEE Options 11, 13 and 14 cover all emissions associated with the production and distribution of electricity by capping emissions from electric utilities. This could only be done under a lifecycle emissions system if all users of electricity (e.g., residential, commercial, etc.) were capped.
3. It would make it more difficult to include transportation-related emissions in the emissions trading system because of the large number of small users of transportation services.

The most important changes, however, relate to the provision of incentives by the trading system. Under an allowance trading system based on lifecycle emissions accounting:

- there would be little direct incentive for fossil fuel producers and importers to reduce their greenhouse gas emissions because they are not directly covered by the emissions cap, and
- there would be clear incentives for users of fossil fuels to reduce greenhouse gas emissions on-site as well as the greenhouse gas emissions associated with fossil fuel production and import.

While there would be little direct incentive for fossil fuel producers and importers to take action to reduce greenhouse gas emissions, they may nonetheless have an incentive to do so if fossil fuel consumers begin to favor fossil fuel producers and importers with a lower carbon intensity in the marketplace. If fossil fuel users make this choice when industry wide upstream emission conversion factors are being used, they will have only a minor impact on their own emission levels. The impact will be much larger if firm specific upstream emission conversion factors are used.

Do fossil fuel consumers actually have the opportunity to make such a choice? In many parts of Canada, a competitive market does not yet exist in the electricity sector – making it difficult for users of fossil fuels to seek out and purchase electricity generated by anyone other than a provincial utility with a virtual monopoly on power generation. This is, of course, changing slowly with the gradual deregulation and liberalization of electricity markets throughout North America. The situation is more promising for consumers of other uses of fossil fuels such as heating and transportation. Strong incentives to make these choices, however, will only be provided in an emissions trading context if firm specific upstream emission conversion factors are used. As noted earlier, this may not be feasible.

All cap and allowance emission trading systems provide a strong incentive for a company participating in the system to reduce its own greenhouse gas emissions and demand for allowances. Under conventional greenhouse gas emissions accounting, this incentive is restricted to the firm. In a system of lifecycle emissions accounting, however, firms also have an incentive to act to reduce upstream emissions through consumer choice and procurement decisions.

Carbon Content Cap and Allowance Trading

One of the potential domestic greenhouse gas emission trading systems examined in the NRTEE process is an upstream carbon content emissions trading system (NRTEE Option # 4). Under this system, a cap is established on the carbon content (i.e., potential greenhouse gas emissions) of all fossil fuels sold for use in Canada. This cap is then allocated among fossil fuel producers and importers. To be in compliance, a fossil fuel producer or importer must hold allowances equivalent to the carbon content of all fossil fuels sold for use in Canada at the end of each year.

Of all the options being examined by the NRTEE, this is the one that most closely reflects lifecycle emissions accounting principles. After all, under this system fossil fuel producers and importers are essentially assigned responsibility for all greenhouse gas emissions associated with the production, use and disposal of their product.[14] Indeed, this option imposes a lifecycle emissions perspective on the producer of fossil fuels while all of the other options discussed to this point impose such a perspective on the user of fossil fuels.

It is in many ways, therefore the mirror image of NRTEE Options 11, 13 and 14 under a lifecycle emissions accounting framework. Under NRTEE Option 4:

- fossil fuel producers and importers have a strong incentive to reduce greenhouse gas emissions associated with their own use of fossil fuels because their emissions are capped[15], and
- consumers of fossil fuels will only receive an indirect incentive to reduce greenhouse gas emissions because their emissions are not capped.

This does not mean, however, that users of fossil fuels have no incentive to reduce greenhouse gas emissions. After all, fossil fuel producers and importers will have an incentive to encourage their customers to use fossil fuels efficiently and to favor less carbon intensive fuels. This incentive will be provided through increased prices for fossil fuels that reflect the carbon content of those fuels – much like a carbon tax.

Such an incentive, however, is unlikely to be strong enough to ensure that users of fossil fuels take on responsibility for the upstream emissions associated with their use of these energy sources. This would only occur if the price increases generated by the emissions trading system allowed all fossil fuel producers and importers to recover the full cost of the allowances they need to comply with their obligations under the cap and allowance

[14] NRTEE Issue Paper Number 5 on the treatment of feedstocks discusses a variety of options through which such a system can address fossil fuels that are not used for energy purposes.

[15] According to the Canadian Association of Petroleum Producers, greenhouse gas emissions associated with oil and gas production are only 1/9 of the emissions associated with fossil fuel combustion by end users.

trading system.[16] If this is not the case, responsibility for upstream emissions will remain with the producers and importers of fossil fuels.

In reality, this system would leave responsibility for upstream emissions with the producers and importers of fossil fuels. After all, Canadian producers of crude oil and petroleum products are unlikely to command a higher price from consumers because their products compete in a global market where a significant portion of total supply comes from countries that will not face legally binding emission limitations commitments under the Kyoto Protocol. Canadian coal producers would face a similar situation because they compete in both domestic and international markets with a number of countries that would not face legally binding emission limitation commitments under the Kyoto Protocol.

The situation is somewhat different for Canadian natural gas producers. These companies may be able to command a higher price for their exports to the United States because American natural gas producers are likely to face similar obligations to reduce greenhouse gas emissions from natural gas production. Moreover, liquid natural gas from developing countries is substantially more expensive that that produced in North America. On the other hand, Canadian producers will have to compete with Mexican exports of natural gas and are likely to face increased competition from oil (because the global market will keep its price down). As a result, Canadian natural gas producers are likely to be able to recover some, but not all, of their costs through higher prices.

Does it make more sense to design an emissions trading system to ensure that producers and importers (NRTEE Option 4) or consumers (adjusted NRTEE Options 11, 13 and 14) are aware of and responsible for the lifecycle emissions implications associated with the use of fossil fuels for energy purposes?

Designing a system that focuses on the producer:

- keeps the number of participants in the system manageable,
- ensures that virtually all emissions will be covered by the system,
- provides a strong direct incentive to reduce greenhouse gas emissions associated with the production of fossil fuels,
- uses a price signal to provide an indirect incentive to users of fossil fuels to reduce their greenhouse gas emissions, and
- is consistent with existing international emissions accounting rules.

[16] This is true for the producers of all products. If an aluminum producer faces a cap on greenhouse gas emissions (e.g., under NRTEE Options 11, 13, and 14), responsibility for the upstream emissions associated with the production of aluminum will not be shifted to aluminum users unless producers can increase prices to the point where they can recover the costs of the allowances they need to be in compliance with the system. The extent to which this is possible will depend on the structure of the world or regional market for specific products.

Designing a system that focuses on the consumer:

- vastly increases the number of potential participants – limiting the potential coverage of emissions provided by the system,
- provides a strong direct incentive to consumers of fossil fuels to reduce greenhouse gas emissions associated with their own combustion of these fuels,
- uses consumer choice in the marketplace to provide an indirect incentive to producers of fossil fuels to reduce their greenhouse gas emissions, and
- requires a change to international emissions accounting rules.

There is no doubt that a system focused on producers will cover a greater percentage of Canada's greenhouse gas emissions through a smaller number of sources – increasing the administrative efficiency of the system. On the other hand, a system that focuses on the consumer provides a strong and direct regulatory incentive for emissions reduction (an emissions cap) to a much larger number of sources of greenhouse gas emissions. In the end, a key factor in the choice would be to assess the relative strength of the indirect signals promoting emissions reductions in the two systems. Which is more effective? A price signal like a carbon tax, or the power of consumer choice?