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Technology Investment Fund: Issues for Consideration

Issue Paper for an Expert Workshop

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1. Introduction

On October 19 2006, The Honourable Rona Ambrose, Minister of the Environment, introduced *Canada's Clean Air Act* in Parliament. Over the next three years, new regulations, targets and timelines will be discussed and proposed in order to lead to significant and long-term reductions in air pollution and greenhouse gas (GHG) emissions from industry, transportation and consumer products.

A number of compliance options are being considered in the development of the regulatory framework, including emissions trading and a technology investment fund (TIF). These options are meant to help minimize the cost of complying with the proposed regulations.

On December 14, 2006, the International Institute for Sustainable Development (IISD) will facilitate an expert workshop on the role for a TIF as a compliance option for air emissions regulations. The workshop is meant to engage governments, industry, NGOs and other experts in a dialogue to gather expert opinion and advice. IISD will provide information gathered through the workshop to the Government of Canada to assist in their development of the proposed regulatory actions.

This document is an issues paper for the expert workshop and provides context for key discussion questions, such as:

- What are the revenue generation options for the TIF?
- What is an appropriate method for determining TIF funding eligibility?
- What should be the defining characteristics of the TIF administrator?
- Is a single TIF for both air pollution and GHG emissions reduction technologies an appropriate mechanism?

2. Setting Context

Before discussing the different options for developing and implementing a TIF, it is important to understand why a TIF might be an attractive compliance mechanism in the Canadian context. Canada's economy profits from the natural resource sector, with many recent benefits coming from the rapidly growing oil and gas and mining sectors. Canada, along with Norway and Australia, is in a unique class of industrialized nations where resource exports significantly impact the domestic economy.

Canada is fortunate to have vast stores of energy resources (fossil fuel, uranium, hydro and other renewables) which are sufficient to meet domestic and export market demands. Energy is expected to dominate Canadian business investment for years to come, and in 2005 energy exports increased by 28 percent to be Canada's leading export worth $87 billion.[1] In addition to rapid growth, the domestic energy sector is undergoing a marked shift from conventional to unconventional sources such as the oil sands, coal bed methane, light gas and liquefied natural gas. Alberta's oil sands represented 42 percent of

[1] Cross, P. 2006. *The Year in Review: The Revenge of the Old Economy.* Canadian Economic Observer. April.

all domestic oil output in 2005, and are forecast to represent 80 percent of production by 2020.[2]

The oil sands aren't the only story on the Canadian energy scene. In 2005, coal was the fastest growing energy export (largely reflecting Asian demand) and coal exports surpassed electricity exports in 2005.[3] In addition, Canada is the largest miner and supplier of uranium and it has the most installed hydro capacity of any country.

However, an economy heavily reliant on natural resources faces environmental challenges. Canadians produce more air pollution per person than nearly all other countries; and Canada is one of the world's highest per capita emitters of GHGs, behind only Australia and slightly higher than the United States. In Canada there is considerable domestic and international pressure to reduce local air pollution and GHG emissions, both of which are considered public health issues. Air pollution is linked with such illness as asthma, heart disease and respiratory disease, and public health experts estimate that air pollution is responsible for 5,900 premature deaths in Canada each year.[4] Climate change induced health issues that are expected to increase in the future include heat waves, increased smog episodes, water and food-borne contaminants and vector-borne diseases.[5] Monetary estimates of the social costs of poor health due to aid pollution, including health care costs, lost productivity, and pain and suffering, runs to the billions of dollars annually in Canada.[6]

Technological solutions are required to allow Canada to obtain the benefits of the country's natural resource wealth while reducing impacts to the environment, but the solutions will vary from region to region. The geographic distribution of Canada's resources dictates the need for different technological solutions for different regions. The fact that each region also faces different environmental issues is another driver of technological choice.

Question:
Should all air emissions, both air pollutants and GHGs, be eligible for TIF contributions? If so, should they be managed under a single TIF?

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[2] Natural Resources Canada, 2006. *Canada's Energy Outlook: The Reference Case 2006*.
[3] Cross, P. and D. Wyman. 2006 *The Changing Compositions of the Merchandise Trade Surplus*. Canadian Economic Observer. November.
[4] Stan Judek, Barry Jessiman, Dave Stieb and Robert Vet. 2004. *Estimated Number of Excess Deaths in Canada Due To Air Pollution.* Air Health Effects Division, Health Canada and Meteorological Service of Canada, Environment Canada. http://www.hc-sc.gc.ca/ahc-asc/media/nr-cp/2005/2005_32bk2_e.html.
[5] Health Canada. 2002. *Climate Change and Health & Well-Being: A Policy Primer for Canada's North.* http://www.hc-sc.gc.ca/ewh-semt/pubs/climat/policy_primer_north-nord_abecedaire_en_matiere/index_e.html
[6] Statistics Canada. 2006. *Canadian Environmental Sustainability Indicators.* http://www.statcan.ca/english/freepub/16-251-XIE/16-251-XIE2006000.htm.

3. Variety of Options

Technology development is crucial for achieving significant reductions in emissions growth, and governments have a key role to play in establishing environments that are conducive to the development and uptake of low emission technologies. A variety of options exist to instigate the development and deployment of new technologies, including both "push" and "pull" policy measures.

The technology push approach focuses on the development of low emissions technologies by governments or other public institutions playing a more direct role in funding technological change through such measures as research and development (R&D) policies, support for demonstration projects, and research through effective public-private partnerships. The technology pull approach focuses on technological change as a product that typically results from economic incentives, and that such change will primarily come from the private sector in response to market signals. Examples of technology pull measures include corporate tax breaks for R&D expenditure, carbon taxes and emission trading schemes.

A portfolio of policy approaches on both the pull and push side will be required to encourage the development and uptake of low emission technologies. A TIF that is tied to the market or some other regulatory compliance mechanism could combine both technology push and pull approaches. The technology push could come from resources and support for the development of technologies that have the potential to contribute to significant, long-term emission reductions. Depending on the structure of the Fund, this could include funding allocations for eligible technology promotion programs or activities that support R&D and commercialization. The technology pull could come from the use of the TIF as a compliance option, whereby companies not meeting their targets could invest in the TIF in exchange for technology investment units or credits that would become part of a company's compliance portfolio in addition to the reduction units generated internally or through the market.

Question:
Is it desirable that a Technology Investment Fund be designed to provide the dual elements of technology push and technology pull?

4. Technology Investment Fund

Through the *Notice of Intent* to develop and implement regulations and other measures to reduce air emissions, the government indicated an interest in a TIF into which industry and potentially governments could contribute to support the development of transformative technologies for emissions reductions. The TIF could be a compliance mechanism for industry to meet their air pollution or GHG emissions requirements. A similar concept was explored in 2005, through the *Greenhouse Gas Technology*

Investment Fund Act. Although never put in force, the Act highlighted some important aspects to be considered today:

- Companies that didn't meet their regulated target could have invested in the TIF up to a set amount, in exchange for investment units;
- The investment units were not to be tradable (they were only to be used for internal compliance);
- The number of units available were to be capped at a set annual amount;
- The cost per unit was to be set at a fixed level not higher than $15 to 2012;
- The fund was to be administered by Natural Resources Canada (NRCan); and
- The funds were to be used for research, development and demonstration, and to create the needed infrastructure to support these activities.

The development of such a compliance-based TIF, especially one that deals with both air pollutants and GHG emissions under a single fund, may be a first of its kind in the world. Lessons can be learned from other programs, but addressing a range of GHGs and air pollutants though a single fund or related funds would be unique.

The United Kingdom has the Climate Change Levy, which is essentially a tax on energy use in the industrial, commercial and public sectors, from which the revenues are recycled back into business by offsetting cuts in employers' National Insurance contributions, and financing and support for programs that promote energy efficiency and stimulate the uptake of renewable sources of energy.[7] The purpose of the levy is to encourage the efficient use of energy, not to raise taxes, and the Government has put in place a range of measures to assist energy users to improve their energy efficiency.

The Air Quality Management Directorate (AQMD) in Southern California has established a Technology Advancement program that uses a combination of regulations and incentives to promote the commercialization of clean technologies. The Advanced Technology Fund, which derives its revenues from the settlement of certain air pollution violations, aims to help companies advance technology rather than simply pay a fine in certain enforcement cases. The Fund supports research, development, public outreach and education related to advanced technology and to air pollution and its impacts.

Question:
Are there similar experiences/schemes that would be helpful in designing the TIF?

[7] Defra. 2006. *Climate Change Levy.* http://www.defra.gov.uk/environment/ccl/

No matter what type of fund is ultimately conceived and developed, three general aspects must be considered in its design:

- How revenue is generated for the TIF is an important front-end consideration;
- How the TIF is allocated or distributed is an important back-end consideration; and
- How the TIF is managed (all the way from the front to the back-end) is an important administrative consideration.

4.1 Front-end Considerations

A broad array of regulatory options could be considered for implementing and generating revenue for the TIF. One option under serious discussion in Canada over the past few years is to draw linkages between the TIF and an emissions trading market, similar to what was proposed in the 2005 *Greenhouse Gas Technology Investment Fund Act*. The technology investment units that companies could purchase under such a scheme would become part of a company's compliance portfolio, in addition to the reduction units they generate either internally or through the market. Factors that will drive the purchase of such investment units include:

- The rate of contribution – the value of each investment unit;
- The amount of units available – the number of units offered and their allocation to individual companies/industries;
- The tradability of the units – rules around buying and selling units, or whether they are to be used for compliance only; and
- Recognition for existing technology investments – the number of units assigned for exiting R&D efforts that meet the TIF's criteria.

In assessing linkages between the TIF and an emissions trading market, it is important to assess the potential impact the TIF might have on markets. For example, could the TIF be a possible price cap that will affect the functioning of the emissions trading market? Could the TIF limit linkages between the Canadian system and other countries' emissions trading systems?

Another option is some sort of a tax or levy, similar to the U.K. Climate Change Levy, which could be set through regulation. The levy could be charged to energy users (as is being done in the U.K.) or to energy producers. This distinction highlights a contentious question that requires delicate consideration.

To facilitate a decision on this issue it's worth exploring some creative incentive options to build into the system so that those who are charged a levy might get something in return. For example, some sort of a tax deduction or another form of recognition could be used to offset other organizational costs. Another incentive could be the recognition of existing research and development (R&D) efforts, meaning a reduced levy for companies/consortia that already invest in emissions reduction technologies (provided the R&D meets the TIF investment criteria).

Regardless of the approach taken a number of common issues must be addressed. For example, should funding come only from industry or should governments (federal or provincial/territorial) be able to contribute leverage funding? One option could be for the federal government to match a certain percentage of the total. Another opportunity is for the provinces to match funding in areas of interest.

The concept of leverage funding brings up an important issue: how to tie revenue generation with funding allocation? Although the argument can be made that one should not influence the other, another line of logic supports the notion that the funds should be allocated to the regions/industries that need the most help in reducing emissions (and, therefore, perhaps to the sectors that pay into the fund in the first place).

A consideration noted throughout this issue paper is the challenge of managing both air pollutants and GHGs under a single administrative instrument. This poses difficulties in determining an appropriate mix of funding from air polluters versus GHG emitters.

Another front-end consideration is how to link the TIF with real emission reductions. What assurances are needed to ensure that the TIF assists in the reductions of air pollutants and GHGs to reduce the health and environmental risks? What monitoring, verification and reporting systems will be required to ensure that the TIF results in real emission reductions, and that the successes or failures are reported in an accurate and timely manner?

Question:
Should the TIF be linked to, or part of, an emissions trading framework? What are views on using a climate change levy or tax as a means of generating revenue for and/or implementing the TIF?

4.2 Back-end Considerations

The previous discussion focuses on revenue generation. This section explores options for funding allocation toward eligible projects, partnerships or consortia. The following is a discussion of selection criteria for assessing investment options. Careful consideration is needed for the design of a successful evaluation and selection methodology.

How broadly one defines eligibility is a primary consideration. This criterion should address the question of whether the fund is intended solely for energy related activities or if it might also include emissions reductions from non-energy related activities (such as chemical processes or agriculture and forestry practices)? An extension of this eligibility question is: what kind of energy activities are eligible (e.g., is renewable energy or clean energy the end goal)?

A second consideration is how to balance priorities? Clearly equilibrium needs to be found between maximizing emissions reductions and equitable fund distribution (to regions and sectors). *Powerful Connections* provides an outline of critical priority areas for Canada:

bio-energy; gasification; carbon dioxide capture and storage; electricity transmission, distribution and storage; fuel cells; and applied social science.[8] The report explores the top priorities in sustainable energy science and technology; it takes a balanced look at regional differences and sustainability issues (including air pollution and GHG emissions).

A decision also needs to be made on the eligibility of technology-based versus knowledge-based projects. Technology and new infrastructure ultimately drives emissions reductions, but softer skills and knowledge often lead to successful technology demonstration and deployment. Developing knowledge and institutional capacities for high-quality science and technology is important.

Another issue of balance relates to the distribution of funding across the technology development stages: basic science, R&D, demonstration and deployment. It is unlikely that a TIF would fund commercial applications. It may also be that certain demonstration projects would be too large for the TIF, and perhaps other targeted financial instruments could be used to address infrastructure needs such as developing an east-west electricity grid or large-scale CO_2 capture and storage infrastructure (such as a CO_2 pipeline).

The funding formula needs to be tied to the entire technology development cycle (the S-curve), as well as to the schedule for infrastructure development and capital-stock turnover. This formula may differ for air pollutants versus GHGs. In fact, the acute nature of air pollution impacts may justify funding projects that can deliver more immediate reductions.

Projects that attract leverage funding from provincial governments, industry consortia or individual companies should perhaps receive favorable consideration. However, this raises the question of recognition for existing R&D activities. Should existing initiatives be eligible for TIF funding, or should funds only be available for new R&D efforts that would otherwise not have been pursued?

Another consideration is whether or not the fund is intended solely for domestic projects/consortia. The advantages of investing in domestic initiatives are typically well understood; but there are also advantages to international partnerships. Canada benefits considerably from participating in a number of International Energy Agency initiatives. These venues provide opportunities to keep up-to-date with leading edge developments, and they provide forums for showcasing Canadian knowledge and expertise to the world.

A final consideration for a broad and overarching fund should be to seek out synergistic opportunities – initiatives that may result in air pollution and GHG emissions reductions. Energy efficiency is a prime example of how to make gains on both fronts. Preference may also be given to projects that result in broader sustainable development benefits such as reduced water use.

Looking for synergies is one thing, but finding points of conflict is equally important. Many examples exist of new activities resulting in unintended consequences. For example, many SO_2 mitigation techniques require more energy use which implies more GHG emissions.

[8] *Powerful Connections* (2006) is the final report of the National Advisory Panel on Sustainable Energy Science and Technology.

Ultimately, methodologies are needed for evaluating the various project opportunities, but getting a workable and acceptable process in place will be difficult. Choosing an experienced administrator, proven to be capable of managing large investment funds, is an important aspect of the TIF's design.

Question:
What is an appropriate method for determining the eligibility of projects, partnerships, or consortia for Technology Investment Fund funding?

4.3 Administrative Considerations

Beyond the discussion in the previous two sections is the issue of the TIF's administration, the hands-on fund management. This is an important decision because whoever assumes responsibility for funding allocation will also be responsible for achieving results. The institution that administers the fund should be scrutinized, evaluated and audited according to standard practices.

One option is to have a government department or agency act as the TIF administrator. Another approach is to have a third party TIF administrator, whose sole responsibility is the success of the fund.

Perhaps the administrator should be chosen using a selection process that includes a clear set of criteria for choosing the appropriate institution. Eligible organizations would likely need to have proven commercial and financial capabilities, strengths in technological knowledge and expertise, and a well established governance structure to provide assurance that the institution is capable of the task. The fund administrator would likely require an advisory board with representatives from industry, academia and environmental groups.

Beyond the question of who manages the fund, is the question of how? One way to solicit eligible project ideas is through an official request for proposals, which would entail clearly stated deliverables and the criteria against which submissions would be judged. Alternatively, an open submission process could be designed whereby anyone is invited to submit proposals, which are then evaluated and ranked according to selection criteria that are tied to the original intent of the fund.

Question:
What should be the defining characteristics of the TIF administrator?

5. Summary Questions

What can realistically be expected from a Technology Investment Fund that is intended to drive success on two fronts: air pollution and GHG emissions?

Working from this overarching question, Table 1 captures the seven high-level questions posed in Sections 2 to 4. In addition to these questions is a second order of considerations that reflect the detailed discussion in this issue paper.

The questions in Table 1 are divided under two categories:

- Overarching questions – the three questions under this category are broader in scope and are intended to prompt discussion on the appropriateness of a TIF in the context of the other available options.
- Technology investment fund questions – the questions under this category are tailored to encourage detailed discussion on the design of a TIF.

Table 1 – Questions and Considerations to Discuss

Overarching Questions (for morning session of Expert Workshop)
Question 1: Should all air emissions, both air pollutants and GHGs, be eligible for TIF contributions and if so, should they be managed under a single TIF? o Specifically, is a TIF helpful for supporting air pollution reduction technologies? - Depends on: the pollutant; pollution source; range of impacts; and the solution.
Question 2: Is it desirable that a Technology Investment Fund be designed to provide the dual elements technology push and technology pull? o How does the answer differ in the context of air pollutants versus GHGs?
Question 3: Are there other similar experiences/schemes that would be helpful in designing the TIF? o What can be learned from other experiences/schemes? o How do the answers differ in the context of air pollutants versus GHGs?
Technology Investment Fund Questions (for afternoon session)
Question 4: Should the TIF be linked to, or part of, an emissions trading framework? What are views on using a climate change levy or tax as a means of generating revenue for and/or implementing the TIF? o What potential impact could the TIF have on emissions trading markets? o Should government(s) match the fund? o How do the answers differ in the context of air pollutants versus GHGs? o What assurances are needed to ensure that the TIF assists in real reductions of air pollutants and GHGs?
Question 5: What is an appropriate method for determining the eligibility of projects, partnerships, or consortia for Technology Investment Fund funding? o What are the criteria for funding allocation? - E.g.: energy-related activities only; balance of priority areas; technology-based activities only; distribution along S-curve; potential fund matching; domestic initiatives only; synergies with other opportunities? o How do the answers differ in the context of air pollutants versus GHGs?
Question 6: What should be the defining characteristics of the Technology Investment Fund administrator? o What competencies would the institution possess? o What is the process for selecting an institution? o How do the answers differ in the context of air pollutants versus GHGs?