

Document # 8491

Carbon Emission Pricing Project

**National Round Table on the Environment and the Economy
Plenary Note**

May 8, 2008

Ottawa, Ontario

MEETING WORKBOOK

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About the Plenary Note

This Note provides an overview of the planned research for the Carbon Emissions Pricing Project. The Note reflects both internal discussions within the Secretariat and subsequent vetted through the National Round Table on the Environment and the Economy's (NRTEE) Expert Advisory Committee on a teleconference on February 14th and a meeting held in Ottawa on May 8th.

Stemming from the May 8 meeting, our research program has evolved and importantly a storyline has emerged that we now use to organize the research. Initially we had organized the research to follow the enabling conditions presented in *Getting to 2050*. While the enabling conditions may still guide how the research is ultimately presented in a follow-up report to *Getting to 2050*, for now we provide a slightly different and evolved storyline.

Background

In January 2008 the NRTEE released a report – *Getting to 2050: Canada's Transition to a Low-Emission Future* – in which we presented a number of key recommendations to the Government of Canada:

1. Canada needs to implement a strong greenhouse (GHG) emission price signal across the entire Canadian economy in order to successfully shift Canada to a lower GHG emissions pathway;
2. The basis of such a price signal should be a market-based policy either in the form of an emission tax, a cap-and-trade system, or a combination of the two;
3. The price signal should be complemented with other regulatory policies; and
4. Canada should establish a Canada-wide plan that leads to better coordination of complementary federal, provincial and territorial GHG emission reduction policies.

This report concluded that a suite of different emission price policy packages could deliver significant GHG emissions reductions over the long-term; however it was observed that the effectiveness of each policy is a question of design and implementation, and that policy design matters. The report also highlighted that there would be implications for Canada, and that policy design matters if costs are to be minimized while ensuring emission reduction targets are achieved.

Recognizing these points, the NRTEE is now seeking to better understand the specific details of both the implications of deep and long-term targets and the design of a preferred policy package. The research agenda to deliver on these two area is provided below.

The Research Agenda

The Government of Canada has announced ambitious long-term GHG emission reduction targets for Canada. In *Getting to 2050* we assessed these targets as the “fast and deep” scenario. In that report we noted that carbon prices in the range of \$75 to \$100 per tonne of CO₂e would be required to meet the 2020 targets of -20% below current levels and carbon prices ramping up to in excess of \$200 by 2050 would be required to meet the government’s target of -60% to -70% below current levels.

At carbon prices of this magnitude we observed that even with very efficient carbon pricing, including an economy-wide price on emissions and a high degree of policy certainty to influence long-term investment decisions, there would be wide-ranging implications. We also noted uncertainties, including the choice of the preferred carbon pricing policy, the choice of complementary regulations, costs and emissions outcomes.

This then left two important areas unspecified that now provide an opportunity for NRTEE to further add clarity to the national carbon policy debate:

- **The Implications of Long-Term Carbon Targets.** Here the identification of implications not only provides insight on the transition to a low carbon future but importantly can be used to identify policies that can manage the transition;
- **The Design of Resilient Carbon Policy Package.** Transition does not only imply a shift to a low carbon trajectory, but also a shifting carbon policy in time. Evolving carbon policy is important since there are a host of uncertainties and so carbon policy will need to be adaptive. This implies that the choice of a preferred carbon pricing policy package will be dynamic and need to evolve in time.

These two broad areas provide the basis for organizing the research and developing a storyline that will form the foundation of the Carbon Emissions Pricing Project. Each of these areas is discussed below, with detailed research project summaries provided in the Annex.

The Implications of Long-Term Carbon Targets

There are a number of research activities that will be undertaken by Secretariat staff directly as well as external consultants. All of these research projects are designed to explore the implications of deep and long-term targets:

- **Competitiveness Assessment.** This project will explore the extent of trade exposure and how carbon costs impact sector performance. We are essentially looking at which sectors are not at risk, which sectors are at risk and how much. As well, we will seek to define how the debate on competitiveness should be framed so that future discussions of climate policy affordability are better grounded. (Research Project 1).

- **The Sectoral, Regional and Consumer Implications of Pricing Policies.** The main objective of this project is to provide a detailed articulation of the existing distribution of both costs and emissions reductions by sector, region and for households. This research will then reveal where instrument choice may have a role to play to address impact concerns and where there may not be concerns. It will also identify where impacts may not be significant. (Research Project 8).
- **A Technology and Investment ‘Road Map’.** A vision of the needed technology deployment between now and 2050 is required as well as the necessary capital investments in time. (Research Project 12).

A Resilient Carbon Policy Package

In many cases below the choice of the preferred policy package will be related to the implications and uncertainties identified above. Therefore, many of the projects discussed below will be linked to the learning above.

- **Assessment of International Climate Policies.** Implementation differences between countries can lead to “implementation risk” where Canada’s domestic policy is not aligned with other major trading partners. The extent of this risk is an issue that needs to be better defined so that policy is adaptive. (Research Project 2)
- **Accessing International Reductions Opportunities.** At increasingly stringent targets the desirability of international purchases may become more important. There is therefore a need to understand the opportunity provided by international reductions, whether formally through the UNFCCC mechanisms, or through informal channels. (Research Project 3).
- **Policy Certainty.** This research will attempt to more clearly define the how to strengthen carbon pricing policy through establishing “policy certainty.” (Research Project 4).
- **Qualitative Assessment of Cap-and-Trade Systems and Carbon Taxes.** This sub-project will identify the relative performance of key cap-and-trade systems and carbon tax design using a common set of policy assessment criteria, and then identify a set of principles to guide implementation. (Research Project 5).
- **Quantitative Assessment of the Impacts of Design Options: Allocations, Recycling, and Border Tax Adjustments.** Economy-wide carbon pricing will have economy-wide effects. Likewise the design elements such as border-tax adjustments, allocations and revenue recycling will have widespread impacts. This project will conduct a macroeconomic assessment of carbon pricing and various design elements, reflecting existing tax distortions. (Research Project 6).
- **Policy Instrument Choice Preference.** The objective of this research project is to discuss with key stakeholders their instrument choice preferences and how these might change in time. (Research Project 7).

- **The Role of Complementary Regulations in Time.** This project will identify when regulations can complement carbon pricing. Specifically it will identify when regulations are expensive relative to carbon pricing and when (and where) they can be a solution. The project will look to the marginal cost of the carbon price and see when and where, in time, regulations are preferred and at what level of stringency. (Research Project 9).
- **Linkages of Policy Approaches: provincial and federal; federal and international.** This research will focus on how trading systems might be linked, and how hybrid tax and cap and trade systems can interact. What are the main principles for the functioning of such systems? (Research Project 10).
- **Federal-Provincial Governance Issues.** Given provincial jurisdiction over energy resources, issues of federal-provincial-territorial governance must be addressed in designing a federal carbon emissions pricing policy. This research will assess issues of provincial-federal policy harmonization, and the implications of fiscal transfers between governments. (Research Project 11).
- **Technology Deployment Barriers and the Role of Research and Development.** This project will focus on the barriers to the deployment of major technologies and how they might be addressed. The effect of carbon pricing on innovation and R&D versus directed R&D policy will also be assessed. (Research Project 13).

General Approach to Analysis

There a number of fundamentals that we will adopt for the research to ensure consistency with *Getting to 2050* but also to make the research more manageable:

- **Where possible CIMS Runs will be used from previous work.** To remain consistent with the *Getting to 2050* report previous CIMS scenarios will be used.
- **Selective Updates to Modeling to Reflect Changing Circumstances.** The business-as-usual (BAU) forecast, especially in the short-term is rapidly changing during to recent global and national events. Notably, we see a need to update energy prices in the model, and production growth and emissions, particularly in upstream oil and gas.
- **Use the Government of Canada’s Targets.** In order to take the focus off target setting, and instead focus on instrument choice and policy design, the targets of -20% below current levels in 2020 and -65%¹ below current levels in 2050 will be adopted. These targets also reflect the NRTEE’s “fast and deep” analysis from our report.
- **Avoid getting dragged down into short-term climate policy.** As discussed during the kick-off meeting call, there is a risk associated with looking at short term

¹ The federal government’s commitment for 2050 is 60% to 70% below 2006 levels; the NRTEE’s analysis in our *Getting to 2050* report examined 65% below current levels.

policies at the provincial and national levels. Simply, complexity and rapidly changing circumstances are a risk to the analysis, and especially to its relevance. Instead, it was argued that the analysis should keep an eye on short-term developments and look how these might be transitioned to a longer-term “preferred” policy package.

Annex A

Enabling Condition 1: Canada Acts in Concert with the World.

1. Competitiveness Assessment and the Implications for Trade-exposed Sectors

Objective:

To explore the extent of trade exposure and how carbon costs impact sector performance. We are essentially looking at which sectors are at risk and how much.

This project will seek to strip away some of the conjecture on competitiveness by distilling the argument down to its constituent pieces. Specifically, there is a need to lay down a common framework for assessing competitiveness impacts at the sector level, and then to complete some preliminary modelling that illustrates the potential impacts of the “fast and deep” *Getting to 2050* scenario (which is the federal government’s targets for 2020 and 2050). A major focus of the work will be to first identify trade exposed sectors and then determine the sectors ability to pass carbon costs on to markets. There will three main tasks for this research:

1. **Explore how climate policy affects sector competitiveness.** This research will start with an explanation of what are the important aspects of this issue with respect to climate policy and competitiveness. It will then to identify those indicators that best convey which sectors are indeed trade exposed. A ranking or threshold of which sectors are or are not trade exposed will be developed.
2. **Economic Modelling.** The overall goal is to determine which sectors absorb the cost or lose market share, and which sectors can pass on the carbon cost. Essentially, the goal is to determine where the carbon cost burden resides.
3. **The identification of sectoral impact for those trade exposed sectors.** Sectors that cannot pass on the costs will likely lose market share and or reduce their profits or output. As a result, there is a need to determine the income burden with carbon pricing by trade exposed sector as well as linked downstream sectors.

Consultant: Infrometrica

2. Assessment of International Climate Policies

Objective:

Implementation differences between countries can lead to “implementation risk” where Canada’s domestic policy is not aligned with other major trading partners. The extent of this risk is an issue that needs to be better defined.

Differences in climate policy between Canada and other countries – particularly our major trading partners – can increase the implementation risk of domestic policy. By evaluating other domestic climate policies that have been, or will soon be, implemented, we can better assess the scope of possible implementation risk. This is not just a look at announced targets, but rather instrument choice. That said, the stringency of other jurisdictions’ policies affects implementation risk for Canada and competitiveness impacts specifically. Closely aligned is the non-party risk, where countries such as China and India are not party to the Kyoto Protocol, and a post-2012 regime.

Key research questions include:

1. What are the key targets of other countries (with a focus on Canada’s largest trading partners)?
2. What are the main design elements of other countries’ domestic climate policy?
3. Where are there implementation risks over time?
4. Where are there non-party risks over time?

Consultant: In-House

3. Accessing International Reductions Opportunities

Objective:

At increasingly stringent targets the desirability of international purchases may become more important. There is therefore a need to understand the options for accessing international reductions, whether formally through the UNFCCC mechanisms, or through informal channels.

While there is uncertainty in the form and function of a post-2012 climate regime, there will likely be a variety of mechanisms to access international reductions. These could include an extension of the Kyoto mechanism markets but will also include emerging mechanism such as avoided deforestation and sectoral approaches. In this project, a number of scenarios will be developed about the likely future climate regime, but importantly opportunities for Canada will be identified. This then will aim to provide a suite of options for Canada to possibly access low cost reductions internationally

Consultant: TBD

10:15 to 10:30 Break

10:30 to 12:00 Part II: An economy-wide emission price signal, implemented with complementary measures, is the core element of a policy framework.

Here we evaluate and model design elements to see what works and what does not, and compare the associated trade-offs.

4. Price, Quantity and Policy Certainty

Objective:

This research will attempt to more clearly define the objectives of a carbon pricing policy in terms of establishing “policy certainty.”

Expected future prices of emissions will influence investment decisions in the present. Effective policy must, therefore, clearly and consistently communicate the nature of an carbon emission pricing policy. “Policy certainty” ensures that the emissions pricing policy will be maintained and that actions taken by firms and individuals to meet the requirements of the policy will not become detrimental under a future policy. Essentially, uncertainty must not diminish the strength of the price signal established by policy.

Two main issues are associated with policy certainty. First, since credible or feasible policy cannot simultaneously establish perfect price and quantity certainty, policy elements should be designed to manage this trade-off. To evaluate policy design elements, objectives must be clearly established: to what extent is quantity certainty desirable over price certainty or vice-versa? A second, related, issue is that of the tension between policy certainty and an adaptive management approach. One objective of the carbon pricing policy was to ensure it could adapt and respond to changes in stakeholder preferences in terms of shifts in global reduction targets, pressure for greater stringency, or even an unsatisfactory response of the energy system to the policy (which could involve either insufficient emissions reduced at a given price, or excessive costs for a given reduction quantity). Again, objectives for the policy regarding this trade-off need to be clearly articulated in order to evaluate specific design elements.

Key Research questions include:

1. How should government best communicate its commitment (over the long term) to a carbon pricing policy?
2. How can policy be designed to be adaptable (to new goals, or new international agreements) without limiting policy certainty?
3. What are key policy objectives regarding price certainty vs. cost certainty?
4. Should priorities for cost certainty vs. quantity certainty change with time? In what way?
5. What are enabling conditions to ensure policy certainty?

Consultant: In-House

5. Qualitative Assessment of Cap-and-Trade Systems and Carbon Taxes

Objective:

To identify the relative performance of key cap-and-trade systems and carbon tax design using a common set of policy assessment criteria, and then identify a set of principles to guide implementation.

In this project, the first goal is to develop a set of cap and trade and tax design options that can guide future climate policy in Canada. A second goal is to distill the considerable information available on cap and trade and tax into a format that highlights the performance against a set of policy assessment criteria. Finally, the challenge, and perhaps the most important goal for this project, will be to distill information into a meaningful set of *guidelines for implementation* or principles that can inform the policy debate in Canada.

Key research questions include:

1. Distill a set of common design elements;
2. Evaluate the performance of each of the design elements against a set of criteria; and,
3. Based upon (1) and (2), establish some fundamental guidelines for implementation of a carbon tax system, within the Canadian context.

Consultant: Natsource for cap-and-trade. Taxes – TBD.

6. Assessment of the Impacts of Design Options: Allocations, Recycling, and Border Tax Adjustments

Objective:

Economy-wide carbon pricing will have economy-wide effects. Likewise the design elements such as border-tax adjustments, allocations and revenue recycling will have widespread impacts. This project will conduct a macroeconomic assessment of carbon pricing and various design elements, reflecting existing tax distortions.

In *Getting to 2050*, the macro-economic module in CIMS provided preliminary estimates of the economic impacts of various carbon mitigation scenarios. These impacts were only partial, however, since the CIMS model is a partial equilibrium model that does not track important macro-economic variables. Similarly, CIMS does not deal with existing tax interaction in the economy, an important consideration when considering economy wide carbon pricing and various distribution schemes such as recycling or allocation alternatives.

There is therefore a need to apply an economy wide equilibrium model, to first more fully articulate the range of macroeconomic impacts of deep and long-term carbon mitigation, but also to form the basis for detailed modelling on various important design elements of carbon taxes and cap and trade systems.

The key tasks of this research include:

1. Develop more sector resolution so that energy-intensive sectors can be better modeled in General Equilibrium and Emissions Model (GEEM – a CGE model calibrated to CIMS emission responses);
2. Develop the dynamic capability of the macroeconomic model GEEM so that simulations to 2050 can be conducted and investment tracked;
3. Develop a mechanism to simulate border tax adjustments, carbon permit allocations and revenue recycling.

Consultant: J&C Nyboer

12:00 to 13:15 Lunch

13:15 to 15:00 Part II: Research on the Pricing Policy Options with Complementary Measures (continued)

7. Policy Instrument Choice Preference

Objective:

The objective of this research project is to discuss with key stakeholders their instrument choice preferences and how these might change in time.

Splits within and amongst sectors are emerging as to the preferred policy package, and the relative merits of cap and trade versus tax. We therefore intend to conduct a series of focused interviews with opinion leaders about their instrument choice preference. This will then be used to inform the development of the policy package and to better understand how design elements may affect stakeholders.

The key research task involves asking different industry groups and ENGOs which policy instruments they prefer and why? This research will also include questioning along the lines of design elements.

Consultant: TBD

8. The Sectoral and Regional Implications of Pricing Policies

Objective:

The main objective of this project is to provide a detailed articulation of the existing distribution of both costs and emissions reductions by sector and region. This research will then reveal where instrument choice may have a role to play to address impact concerns.

The *Getting to 2050* analysis developed the “fast and deep” emissions reductions pathway for meeting the government’s greenhouse gas reductions targets. Stakeholders are interested in the implications of the “fast and deep” trajectory (as forecasted with CIMS) on their own specific regions and sectors. A more detailed articulation of the implications by region and sector would therefore be useful.

This analysis will use the existing CIMS runs from *Getting to 2050* to assess the impacts on sectors and regions of the proposed price signal in terms of emissions reduced unit costs and changes in production.

Consultant: J&C Nyboer

9. The Role of Regulations in Time

Objective:

This project will identify when regulations can be expensive relative to carbon pricing and when (and where) they can be a solution. The project will look to the marginal cost of the carbon price and see when and where, in time, regulations are preferred and at what level of stringency.

Analysis leading to *Getting to 2050* suggested the use of targeted regulations to address market failure and a lack of market coverage to complement pricing policies. Central in these policies were aggressive buildings codes and vehicle emissions standards; these approaches were modeled but were neither described nor analyzed in depth in *Getting to 2050*. These regulations, however, provided a significant portion of emissions reductions, and therefore merit more attention.

Specific key research questions include:

1. When should regulations be used to complement a price signal?
2. In which sectors would regulations be helpful?
3. How stringent should regulations be?
4. What are costs associated with the regulations?
5. What are the added values (i.e. emissions reductions associated with the regulations)?
6. Does the timing of the regulations affect their cost-effectiveness?

Consultant: J&C Nyboer

10. Linkages of Policy Approaches: provincial and federal; federal and international

Objective:

This research will focus on how trading systems might be linked, and how hybrid tax and cap and trade systems can interact. What are the main principles for the functioning of such systems?

The first component of this research would start with the identification of key linkage issues between cap and trade systems, but also issues of taxation, and place them within the Canadian context. This research will look to existing and developing systems that are linked, in order to identify 'lessons learned', highlighting the potential concerns/issues, as well as the advantages and benefits. Existing examples that could be evaluated include the EU ETS linkage with the CDM, the EU ETS linkage with the Joint Implementation (JI). In the Fall 2007 the EU, several U.S. states, Canada, Norway and New Zealand launched the International Carbon Action Partnership (ICAP) which intends to push for a worldwide market that will allow cross-border trading in permits; this system could also provide some guidance on the linkage issue.

Some of the key issues for linking include: compatibility of registries; equalization of levels and systems of sanctions; congruence of emissions reduction targets; elimination of 'safety

valves?; congruence of emissions monitoring and reporting provisions; and fungibility of emissions reduction units.

Key Research Questions:

How could different carbon pricing mechanisms be linked, domestically and internationally? This issue is comprised of three key questions:

1. How would a federal cap-and-trade system link with other systems, especially with the U.S. and the EU ETS; what would be the key considerations and design elements?
2. If a hybrid system were implemented, with a cap-and-trade for the large industrial emitters, complemented with a tax for the other ~50% of the Canadian economy, how would such a system link up internationally? What would be the key considerations and design elements?
3. If Canada was to implement a carbon tax at the federal level, and assuming there would be flexibility for equivalency agreements with the provinces, what are the main considerations?

Consultant: TBD

15:00 to 15:15 Break

15:15 to 16:00 Part III: Governance and Technology Deployment.

Governance

11. Federal-Provincial Governance Issues

Objective:

Given provincial jurisdiction over energy resources, issues of federal-provincial-territorial governance must be addressed in designing a federal carbon emissions pricing policy. This research will assess issues of provincial-federal policy harmonization, and transfers between governments.

In particular, when transfers between regions are included, the design of a revenue recycling mechanism involves trade-offs between environmental effectiveness, distribution, and political acceptability. Carbon-intensive regions such as Alberta and Saskatchewan will strongly object to policies that they feel will redistribute wealth from their energy industries to other provinces. On the other hand, if allocation of recycled revenues is broadly left to the discretion of each province, variations in approaches could create uneven distributional impacts between provinces. Provincially implemented policies (such as the BC carbon tax and Cap and Trade system) would further create variability between regions. A harmonized price signal could be more effective than a regionally variable approach. Finally, designing

the policy to reduce trade exposure could be more challenging with variability between provinces since border tax adjustments are a federal power.

Key Research Questions:

1. What constitutional issues affect the implementation of federal and provincial carbon emission pricing policies?
2. What are the possible design options for revenue recycling in terms of ensuring distributional equity between regions?
3. What are the implications for these options in terms of relative environmental effectiveness, distribution, and political feasibility?
4. How important is harmonized policy and harmonized revenue recycling between provinces?
5. How do linkages between federal and provincial pricing policies affect optimal revenue recycling design?
6. How do linkages with international systems (e.g. WCI, ETS) affect optimal revenue recycling design?

Consultant: TBD

Technology Deployment

Here the main thrust will be to provide a technology road map that mirrors the preferred mitigation path. First we will identify the technology deployment opportunities as well as barriers that may exist. Existing modelling results will be mined to show the technology deployment road map, and the questions will be asked with respect to barriers to additional implementation.

12. A Technology ‘Road Map’

Objective:

A vision of the needed technology deployment between now and 2050 is required as well as the necessary capital investments in time.

The “fast and deep” emissions reduction pathway implies substantial growth in market share for different low carbon intensity technologies. In *Getting to 2050*, the technology implications and the investment profile required to deploy these technologies were not articulated. This project will mine CIMS for the “fast and deep” pathway with the objective of identifying major technology shifts that account for substantial emission reductions.

This is a first step that will then be used to “ground-truth” the feasibility of the technology implications of the pathway as predicted by CIMS (see project 12 below).

This analysis will again use existing CIMS outputs to address the following key research questions:

1. What are the key growth technologies implied by the “fast and deep” scenario (i.e. which technologies have large contributions to the emissions reductions of the “fast and deep” policy scenario relative to the BAU)?
2. How much additional (to the BAU) investment is required?
3. How does this investment compare with historical investment in technology?
4. Do any of these “key technologies” likely face barriers to deployment?

Consultant: J&C Nyboer

13. Technology Deployment Barriers and the Role of Research and Development

Objective: A discussion of the barriers to the deployment of major technologies and how they might be addressed. The effect of carbon pricing on innovation and R&D versus directed R&D policy will also be assessed

The *Getting to 2050* analysis indicated that some sectors did not respond to a carbon price signal. Part of this lack of responsiveness may be due to the presence of additional market failures associated with technological change. It is well known that “technology policy” targeted specifically at developing and deploying emissions-reducing technology could complement emissions pricing policy by overcoming market failures. Paralleling the literature, we follow two separate lines of inquiry under the “Technology Policy” heading.

- **Deployment Barriers.** The “Technology Road Map” research (project 11 above) will highlight the growth of key low emitting technologies. These technologies may face barriers to deployment such as the lack of a regulatory framework, lack of infrastructure, lack of public acceptance, and lack of capital investment.
- **The Role of Research and Development.** Even under an aggressive carbon pricing policy, research and development may be under-provided for because firms’ incentives to innovate are diminished through knowledge spillovers to other firms: an innovating firm does not reap all benefits of a new innovation.

The key research questions are:

1. What market barriers (or failures) exist for technology innovation and technology diffusion?
2. Which “key growth technologies” implied by the “fast and deep” trajectory face potential barriers to this growth?
3. What are the costs of overcoming these market barriers or failures through policy?
4. What are the benefits of overcoming these barriers (emissions reductions, cost reductions?)
5. What policies could be used to overcome these barriers?
6. How can policies be developed that target technology deployment directly without being prescriptive and “picking winners?”
7. How can cost-effective policies be developed that target research and development?

Consultant: TBD

16:00 to 16:15 Final Comments and Wrap-up