CLIMATE PROSPERITY

A CANADIAN INITIATIVE

PARALLEL PATHS: CANADA-U.S. CLIMATE POLICY CHOICES

// REPORT 03

National Round Table on the Environment and the Economy

Table ronde nationale sur l'environnement et l'économie

Canada

THIS IS NOT JUST ABOUT COPING WITH CLIMATE CHANGE, BUT PROSPERING THROUGH IT.

A CANADIAN INITIATIVE

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MESSAGE FROM THE CHAIR

Where geography has made us neighbours and economics has made us partners, as one American president reminded us, climate change brings a powerful new dimension to the deep relationship Canada and the United States have with one another.

Canada's most important trading partner has become Canada's most important climate partner. We need to understand how we can meet our environmental responsibilities as a sovereign state and a global actor fully comprehending the unique economic ties we enjoy on this continent.

Canada has embarked upon a path of climate policy harmonization with the United States. This has significant implications to our own climate policy ambitions and realizations.

The NRTEE's report *Parallel Paths: Canada-U.S. Climate Policy Choices* spells out those implications – economically and environmentally – for Canada. We offer new insights and analysis to governments, business, the environmental community, and Canadians on just what harmonizing climate policy with the United States means. Importantly, in a time where uncertainty on U.S. policy direction is growing, we show how and where a made-in-Canada approach can move us forward, respecting our overall goal of climate policy harmonization, to meet our national GHG targets.

Common cause in developing and implementing effective and realistic climate policies that meet stated greenhouse gas emission reduction targets makes sense. But that cause must truly be 'common', and Canada and Canadians may need to consider – sooner rather than later – a transitional policy option in its stead.

The Government of Canada has made positive and important strides on climate policy harmonization with the United States. As it contemplates additional steps to meet the GHG emission targets it has set, the NRTEE's report suggests a new way forward to climate prosperity.

BOB PAGE
NRTEE Chair

MESSAGE FROM THE PRESIDENT AND CEO

Canadian climate policy has been and will be influenced by the United States. Canada's goal of harmonizing carbon-reduction policies and actions with those of the U.S. has significant implications for our own environmental objectives and economic security. In short, it shapes our climate policy ambition and opportunity.

Our integrated economies require active consideration of the impacts of U.S. policy, and Canadian policy in response while working towards our harmonization goal. But a key question remains: If America holds back, can Canada still move ahead?

This report says, yes we can.

The National Round Table on the Environment and the Economy has completed over a year of analysis and original modelling to determine how far and how fast Canada could go to meet its stated emission reduction targets while growing our economy.

The NRTEE offers a transitional policy option for decision makers to consider. It reduces emissions here in Canada while maintaining our competitiveness, and results in more investment in needed low-carbon innovation for the future. It builds on existing policy direction so it can work.

Harmonization, where possible and when feasible, makes sense for Canada. But in the face of persistent U.S. uncertainty as to its own climate policy future, Canada will need to look to its own options, in the right way, at the right time. We hope this new report, the third in the NRTEE's *Climate Prosperity* series, helps illuminate a path forward.

DAVID McLAUGHLIN
NRTEE President and CEO

ABOUT US

Emerging from the famous Brundtland Report, *Our Common Future*, the National Round Table on the Environment and the Economy (NRTEE or Round Table) has become a model for convening diverse and competing interests around one table to create consensus ideas and viable suggestions for sustainable development. The NRTEE focuses on sustaining Canada's prosperity without borrowing resources from future generations or compromising their ability to live securely.

The NRTEE is in the unique position of being an independent policy advisory agency that advises the federal government on sustainable development solutions. We raise awareness among Canadians and their governments about the challenges of sustainable development. We advocate for positive change. We strive to promote credible and impartial policy solutions that are in the best interest of all Canadians.

We accomplish that mission by fostering sound, well-researched reports on priority issues and by offering advice to governments on how best to reconcile and integrate the often divergent challenges of economic prosperity and environmental conservation.

The NRTEE brings together a group of distinguished sustainability leaders active in businesses, universities, environmentalism, labour, public policy, and community life from across Canada. Our members are appointed by the federal government for a mandate of up to three years. They meet in a round table format that offers a safe haven for discussion and encourages the unfettered exchange of ideas leading to consensus.

We also reach out to expert organizations, industries, and individuals to assist us in conducting our work on behalf of Canadians.

The *NRTEE Act* underlines the independent nature of the Round Table and its work. The NRTEE reports, at this time, to the Government of Canada and Parliament through the Minister of the Environment. The NRTEE maintains a secretariat, which commissions and analyzes the research required by its members in their work.

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0.0 EXECUTIVE SUMMARY

A central question in Canadian climate policy remains, "What of the United States?"

Uncertainty about American climate policy colours and shapes Canada's own policy choices and direction. By necessity, our integrated economies require serious consideration of harmonizing Canadian climate policy with that of the United States. But different energy economies and greenhouse gas emission profiles in the two countries create different economic and environmental implications for Canada as we pursue a harmonized policy approach.

Understanding what these implications mean for Canada and how we implement our own climate policy is critical for Canada's own prosperity. Thinking strategically about how best to harmonize Canadian climate policy with that of the U.S. allows us to design a system that manages competitive risks, achieves real emission reductions, and drives the development of new clean energy and low-carbon technology. Challenges arise if the U.S. doesn't move. What options exist for Canada? What steps can we take to achieve our own national environmental and economic goals given the integrated nature of our trading, investment and energy economies?

With this report, the National Round Table on the Environment and the Economy (NRTEE) has undertaken the most comprehensive analysis yet published on the economic risks and opportunities for Canada of climate policy in the context of the Canada-United States relationship. This is one of seven reports on the economic risks and opportunities of climate change to Canada we call *Climate Prosperity*. We have undertaken this research to inform future policy choices by governments and offer innovative ideas on how Canadian interests can best be served as we secure our future in a climate-changing world. Climate policy has both environmental and economic implications at its core; this report integrates both considerations in order to understand better how Canada can choose a path toward real emission reductions while ensuring a prosperous economy.

The NRTEE's original research and analysis in this report explores the economic and environmental implications for Canada of leading, lagging, and harmonizing with the U.S. on climate policy. Our analysis leads us to the following conclusions:

// **HARMONIZING** on carbon targets and harmonizing on carbon price have different consequences. Canada's distinctive emissions profile and energy-economy structure mean that matching our GHG targets with those of the U.S. leads to higher carbon prices here. Alternatively, while matching carbon prices with those in the U.S. would reduce competitiveness concerns, fewer emission reductions would actually occur due to projected higher emissions growth in Canada than in the U.S. As a result, Canada would not meet its stated 2020 target.

// **COMPETITIVENESS** issues matter, but they matter most for about 10% of Canada's economy that is considered emissions-intensive and trade-exposed, including sectors such as oil and gas extraction, and cement manufacturing. Knowing this allows us to take mitigating actions that reduce the impact on those sectors and regions of the country through targeted policy measures.

// **TRADE MEASURES** in U.S. legislative proposals and low-carbon fuel standards do pose an economic risk for key Canadian sectors but these risks can likely be managed if Canada adopts equally stringent climate policy as the United States. Acting remains the best preventative measure.

// **COSTS IMPOSED** by Canada's own climate policies and resulting emission reductions have the most impact on Canadian industry. It is not just costs from U.S. policy actions or from differences between Canadian and U.S. policies that matter. This means some costs will be present regardless of when Canada implements its full suite of climate policy actions.

While no approach is risk-free for Canada, smart policy choices represent an opportunity for Canada to manage these risks. Our analysis led us to consider an innovative policy option that would allow Canada to take the appropriate initiative in the face of uncertain U.S. climate policy and to position us to move forward, building on regulatory steps already underway even if the U.S. does not. This Transitional Policy Option would implement an economy-wide cap-and-trade system in Canada ahead of the U.S., but would limit the Canadian carbon price so that it would never become too out of step with the U.S. Our proposed approach would walk a middle line between harmonizing with the U.S. on carbon price and on emission-reduction targets, balancing competitiveness and environmental concerns. It would drive the development and deployment of low-carbon technologies and achieve real emission reductions. At the same time, it would limit competitiveness risks for Canada, ensuring continued strong economic growth in all sectors and regions, and would reduce the risks from U.S. trade measures.

The NRTEE therefore recommends that the government of Canada consider the merits of a transitional, made-in-Canada strategy for harmonization:

1. // **IN THE SHORT TERM,** Canada could implement a Transitional Policy Option, with the following elements:

   // **CONTINGENT CARBON PRICING** — to establish a price collar that limits the Canadian carbon price to be no more than $30/tonne CO_2e higher than the price in the U.S.;

   // **NATIONAL CAP-AND-TRADE SYSTEM** — with auctioning of permits and revenue recycling to cap emissions and address regional and sectoral concerns;

   // **LIMITED INTERNATIONAL PERMITS AND DOMESTIC OFFSETS** — to keep domestic carbon prices lower for Canadian firms, thus maintaining competitiveness and further harmonizing with U.S. policy direction; and

   // **TECHNOLOGY FUND** — to keep domestic carbon prices lower for Canadian firms, align carbon prices close to those in the U.S., and stimulate investment in needed emission reductions technologies.

2. // **IN THE LONGER TERM,** if the U.S. eventually implements its own cap-and-trade system and when it is willing to link with a Canadian system, an integrated North American carbon market could be established. The resulting common carbon price between Canada and the U.S. would level the competitive playing field for Canadian industries. Because of our own earlier action, we would be ready for this eventuality.

This phased approach would ensure we are ready and prepared to harmonize effectively and advantageously if the U.S. is ready to move. As we start on this path, we can adjust our own efforts as needed depending upon U.S. actions. In this way, we get ahead of the curve, but carefully so, ensuring economic impacts on Canada are manageable and sustained environmental progress toward achieving our 2020 target occurs.

In this report, we have developed a path toward achieving eventual climate policy harmonization with the United States. Canada needs to strategically plan for harmonization. Canada needs to ensure that we use this time and opportunity to prepare for low-carbon economic success by investing in and developing new environmental technologies.

INTRODUCTION

// CHAPTER 01

1.0 // INTRODUCTION

1.0 INTRODUCTION

Uncertainty about U.S. commitment and direction on climate change affects the scope and scale of long-term policy direction and commitment here in Canada.

Competitiveness concerns loom large in Canadian climate approaches due to the integrated nature of our energy, investment, and trading relationship with those of our largest economic partner, the United States. A shift to harmonization and alignment of Canadian climate policies with those of the United States, from greenhouse gas emission-reduction targets to vehicle fuel-emissions standards, has been the result.

But what does this really mean for Canada's own longer-term climate policy? What are the environmental and economic implications of harmonized or aligned Canadian policies with those of the United States? What does delay and uncertainty in U.S. climate policies imply for our own policy choices? What options need Canada consider if the U.S. doesn't move?

There are economic risks from independent Canadian action, but there are also risks to inaction. So, how can we best implement climate policy in Canada to achieve our environmental goals at least economic cost in the short term, while preparing Canada's economy for a clean energy and low-carbon economic future? In short, is there a made-in-Canada, transitional path forward, and what might it look like?

This report examines these questions. It is the third report of the National Round Table on the Environment and the Economy's (NRTEE or Round Table) *Climate Prosperity* series exploring the economic risks and opportunities for Canada resulting from a changing climate and from the global transition to a low-carbon economy. In this report, the NRTEE explores the risks and opportunities for Canada of designing and implementing climate policy in light of possible U.S. climate policy. The report seeks to identify a policy option for Canada to minimize risks — both environmental and economic — while seizing the opportunities to set Canada on a path toward long-term climate prosperity. It considers how this transitional option can be usefully integrated into existing Canadian climate

policy directions and ambitions if the U.S. does not move, but also considers how best to position Canada if the U.S. does ultimately move forward.

On January 30, 2010, the Government of Canada committed in its submission under the Copenhagen Accord to targets that align exactly with the U.S. — 17% reduction of GHG emissions below 2005 levels by 2020. This was a change in targets from the government's *Turning the Corner* plan. Federal Environment Minister Jim Prentice stated in February 2010:

"We have adjusted our previous target to ensure that it matches exactly with those just inscribed by the United States and we have consistently said from the outset that we must harmonize our climate change strategy with that of our greatest trading partner because of the degree of economic integration between our two countries."[1]

But Canada could implement a strategy of climate policy harmonization in more than one way, with potentially very different implications for economic and environmental outcomes. While Canada has matched U.S. targets and taken some steps in response, the government's overall policy plan to achieve these targets is incomplete, pending greater U.S. certainty and clarity. Meanwhile, we have already seen alignment of vehicle fuel emissions standards for cars and trucks with the U.S. This step is a strong indication of alignment, not just on targets and timing, but also on instruments and actions. Yet Canada has also indicated a willingness to differentiate its policy from the U.S. where appropriate; in June 2010, it announced regulations to phase out coal-fired electricity plants in Canada starting in 2015.

Nevertheless, this distinction between targets and policy is important since the new targets are apparently conditional on the U.S. also implementing policy to achieve its targets. Overall, it seems, Canada will not establish or implement its core climate policy until U.S. direction is clear. But significant uncertainty exists as to both the timing and substance of U.S. climate policy and what this will ultimately mean for Canada. The House of Representatives passed the American Clean Energy and Security Act (known as Waxman-Markey) in June 2009. More than a year later, the Senate considered a range of options, including most recently, the American Power Act of May 2010 (known as Kerry-Lieberman), but finally chose not to bring a climate bill to the floor in 2010.

1 Environment Canada (2010).

Behind the basic economic story are the differences between two key aspects of any country's climate policy: GHG emissions growth and energy mix. Here, Canada and the United States are different. Our emissions are growing faster than those in the U.S., principally due to projected oil sands production and export growth. This means achieving emission-reduction targets relative to 2005 in Canada and curbing emissions growth is potentially a larger task than in the U.S. Further, our energy mix contains more hydro and is less reliant on coal- and gas-fired generation at the national level than in the United States. This means the U.S. could achieve large emission reductions by replacing its coal-fired electricity plants with less carbon-intensive alternatives, while Canada requires a broader range of measures across multiple sectors to reduce emissions. Both are significant challenges with significant costs, but these differences suggest that two countries could take different paths toward achieving emission reductions.

The implication of these factors, coupled with U.S. climate policy uncertainty as to scope, scale, and timing of its actions to reduce emissions, is that Canada's stated commitment to harmonize our policies is not as straightforward as it might seem. It leaves us open to both risks and opportunities. Understanding these implications is essential if Canada is to manage economic risks while positioning itself for deep long-term emission reductions. Central to this discussion of risks and opportunities are three issues:

FIRST, competitiveness clearly matters for a few economic sectors; these sectors account for about 10% of Canada's GDP. But our analysis suggests that the policy the U.S. implements and how it differs from Canada's are less impactful upon industry than the choices we make to reduce emissions within our own economy.

SECOND, uncertainty regarding an eventual U.S. approach complicates Canada's position by potentially delaying some of our own actions with consequent environmental risks. As the NRTEE has shown in *Achieving 2050* and *Getting to 2050*, uncertainty and policy delay will increase the costs of achieving Canadian emission-reduction targets in both the medium and longer term. With only a decade ahead of us before the 2020 deadline, comprehensive action is required if we are to successfully meet our GHG reduction target at least cost and position ourselves for longer-term reductions and a low-carbon transformation in the future.

THIRD, Canada and the U.S. have different economies and emissions profiles and as a result, respond differently to policy. Our analysis suggests that to achieve the same emission reduction targets as the U.S., Canada would require policy that imposes a greater carbon price in Canada relative to the U.S. Higher Canadian carbon prices could competitively disadvantage some Canadian industries relative to their American competitors. But if Canada were to instead implement policy that imposed the same carbon price as that in the U.S., it would not achieve its emission reduction targets. Further, the lower level of reductions could expose Canada to carbon-protectionist trade measures imposed by the United States.

This report builds on previous NRTEE work on carbon pricing and cap-and-trade systems. Our approach is to consider existing and stated federal and provincial government policy directions and offer a potential policy path forward in the face of uncertain U.S. climate policy and apparent economic risks. In this way, we can see which national approaches may be most viable to help Canada achieve its environmental goals, at least economic cost.

THE OBJECTIVES FOR THIS REPORT ARE TWO-FOLD:

1. // **ASSESS** the implications of U.S. climate policy choices for Canada and for various Canadian climate policy options.

2. // **IDENTIFY** policy options leading to long-term emission reductions while managing the economic risks for Canada of adverse national, regional, and sector-level impacts from both potential U.S. and domestic policy choices.

The analysis and findings from *Achieving 2050*[2] form a foundation for this report and provide some of the architecture for the policy options it examines and recommends. This report digs deeper with a specific focus on the interaction between Canadian and American climate policy choices and what they could mean to Canada's economy and its ability to meet its GHG emission reduction targets. But the international policy and political landscapes since Copenhagen have shifted and continue to evolve, both here and in the United States. A major challenge for our analysis was therefore to adapt and revise our approach to ensure it was current and relevant. With continually changing U.S. legislative

2 *Achieving 2050: A Carbon Pricing Policy for Canada* (NRTEE, 2009) recommended that Canada implement a unified carbon price across emissions and jurisdictions through a national cap-and-trade system with complementary policies and access to international carbon abatement opportunities.

proposals and evolving Canadian targets and policy in response, we designed a research framework to account for both uncertainty from the U.S. and uncertainty about what this might mean for Canada's own policy choices.

THIS REPORT IS ORGANIZED AS FOLLOWS:

IN CHAPTER 2, we set the stage and provide context for our analysis, highlighting issues of carbon competitiveness and the economic and environmental implications for Canada of delaying the implementation of a cap-and-trade system in Canada. We also describe the economic modelling approach we have taken to assess a range of climate policy scenarios, and we summarize key assumptions.

IN CHAPTER 3, we identify Canada's choices in the face of uncertain U.S. climate policy, and quantify economic and environmental risks for Canada that could result from these choices. We explore risks if Canada lags behind U.S. action, including possible U.S.-imposed carbon border measures. We also assess the economic risks of implementing policy independent or ahead of the U.S. Finally, we assess the risks of harmonizing with U.S. policy.

IN CHAPTER 4, to address these risks, we analyze the opportunities for Canada to move ahead in an uncertain U.S. climate policy context. We assess different policy tools that can be applied to harmonize Canadian policy with the U.S. but also tools that could allow Canada to responsibly lead.

IN CHAPTER 5, we consider a made-in-Canada transitional policy option designed to reduce economic risks for Canada in the short term and optimize medium- and long-term opportunities to achieve emission reductions. If the U.S. fails to implement climate policy in the interim, this approach could allow Canada to begin the transition toward a low-carbon future while managing risks of competitiveness, trade measures, and any adverse regional and sectoral impacts.

IN CHAPTER 6, we summarize the conclusions and recommendations that emerge from our analysis.

SETTING THE STAGE

// CHAPTER 02


L BRIDGE
CANADA

2.0 // SETTING THE STAGE

2.1 // THE CANADIAN-AMERICAN TRADE, ENERGY, AND EMISSIONS RELATIONSHIP

2.2 // FRAMING ISSUES: COMPETITIVENESS AND POLICY DELAY

2.3 // RESEARCH APPROACH

2.0 SETTING THE STAGE

This chapter sets the stage for our analysis of implications for Canada of both Canadian and U.S. climate policy choices.

First, we begin with an overview of the Canadian-American trade, energy, and emissions relationships. We explore the close integration between the Canadian and U.S. economies, as well as key differences between the structure and emissions profiles of the two countries. Second, we set out the two key economic and environmental framing issues for our more detailed analysis of Canadian and U.S. climate policy in subsequent chapters: competitiveness and policy delay. We explore competitiveness issues in terms of which Canadian sectors are vulnerable due to their emissions intensity and level of trade exposure. We also present updated analysis on the costs of policy delay. Finally, we present our research approach, including economic modelling and other analytical tools utilized to quantify and assess a range of scenarios and impacts of potential U.S. and Canadian climate policy. We also describe our own engagement of Canadian and U.S. stakeholders and experts. This process of consultation ensured that our findings reflected the most recent policy movements in both countries.

2.1 THE CANADIAN-AMERICAN TRADE, ENERGY, AND EMISSIONS RELATIONSHIP

The differences between Canadian and U.S. emissions profiles and energy economies, combined with their high level of integration, lead to complex implications for Canadian and U.S. climate policy.

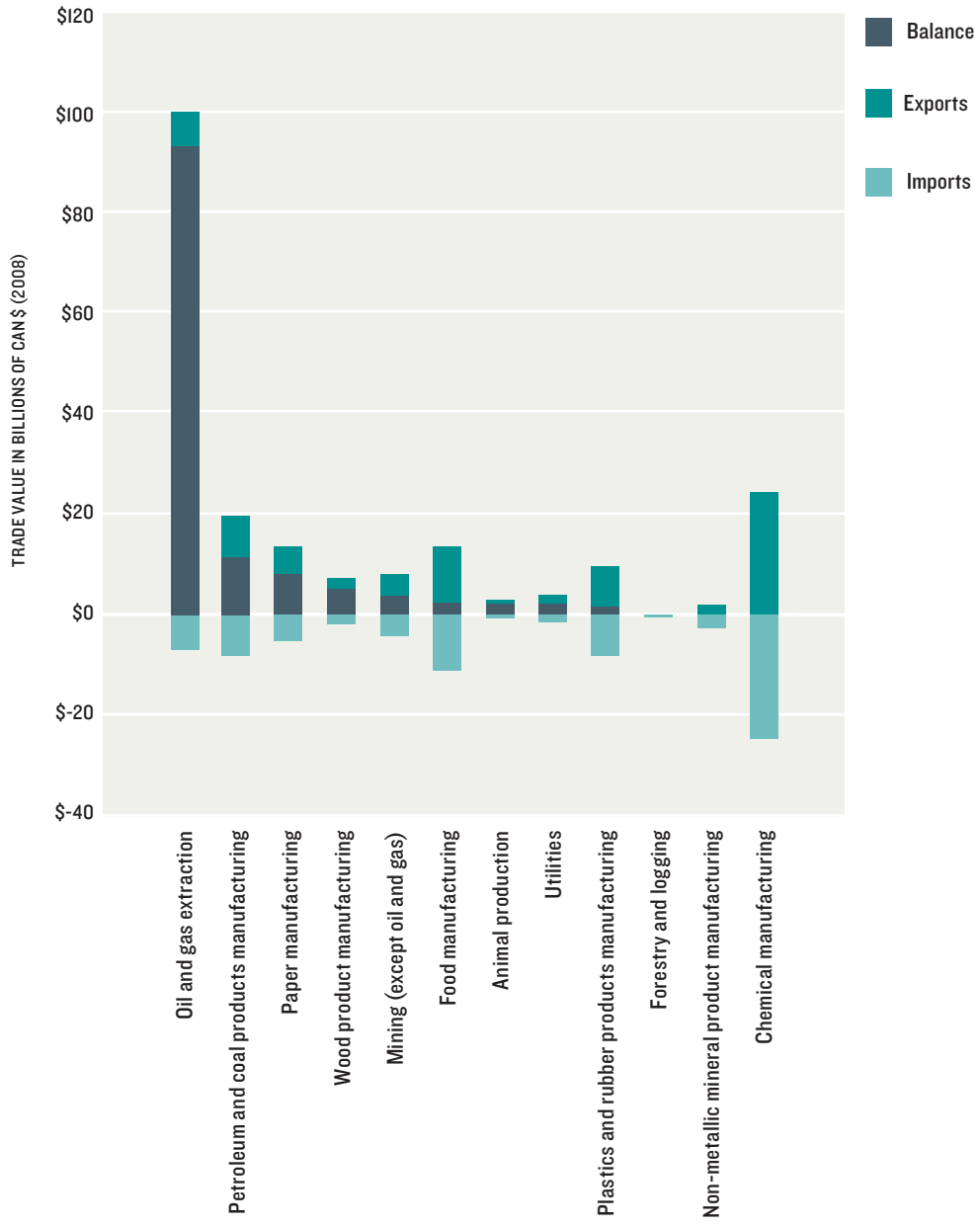
Much of Canada's wealth and well-being is attributable to our success as a trading nation, and in particular, trade with the United States. The U.S. is the largest market for Canadian exports, and the largest single source of Canadian imports. In 2008, over 77%

of Canadian exports were destined for U.S. markets. The U.S. is the primary destination for Canada's largest exporting sectors, including our energy and agricultural sectors. The U.S. accounts for around 65 % of Canadian imports, with the leading sectors being automobile manufacturing and parts, followed by the aerospace industry.

The characteristics of the two economies and the trade flows between them provide important context for discussions on Canada-U.S. climate policy issues. On the one hand, because of the high level of trade integration between the two countries, climate and energy policy choices in the U.S. have both economic and environmental implications for Canada. Differences in policies can lead to competitive advantages for firms in one country. On the other hand, Canada and the U.S. have different energy sources, emissions profiles, forecasted rates of emissions growth, and costs of reducing emissions. While there are obvious complementary elements, crafting a Canadian clean-energy strategy that seeks to integrate economic, environmental, social, and regional factors suggests that a uniquely Canadian policy approach — complementary but different — could best meet Canada's needs.

Figure 1 depicts the exports, imports, and trade balance between Canada and the U.S. by sector. In 2008, Canada had major trade surpluses with the U.S. in oil and gas extraction, petroleum and coal products manufacturing, paper manufacturing, and wood product manufacturing. Canada's exports to the U.S. are significantly less diverse than U.S. exports to Canada. The oil and gas industry is now the largest source of Canadian exports to the U.S., after nearly doubling in value over the last five years.

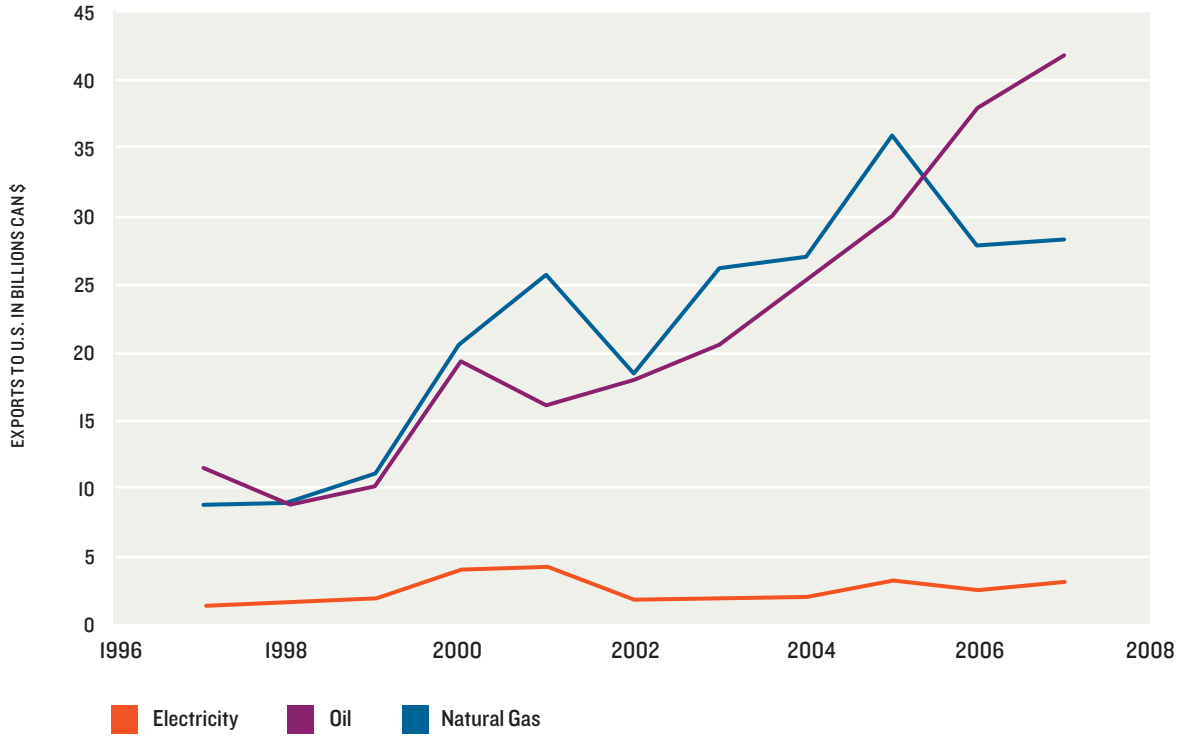
FIGURE 1 CANADA/U.S. EXPORTS, IMPORTS, AND TRADE BALANCES FOR SELECT INDUSTRIAL SECTORS FOR 2008



SOURCE: INDUSTRY CANADA (2010)

The value of Canadian energy exports to the U.S. has grown substantially in the past decade. Oil exports now total more than $40 billion a year while natural gas exports are more than $28 billion a year. As shown in **Figure 2**, this growth is primarily due to an increase in oil and natural gas exports (and rising prices for these commodities). Revenues from electricity exports have, by contrast, remained relatively flat over the same period, in the range of $1-4 billion per year.

FIGURE 2 CANADIAN EXPORTS OF OIL, NATURAL GAS, AND ELECTRICITY TO THE U.S.

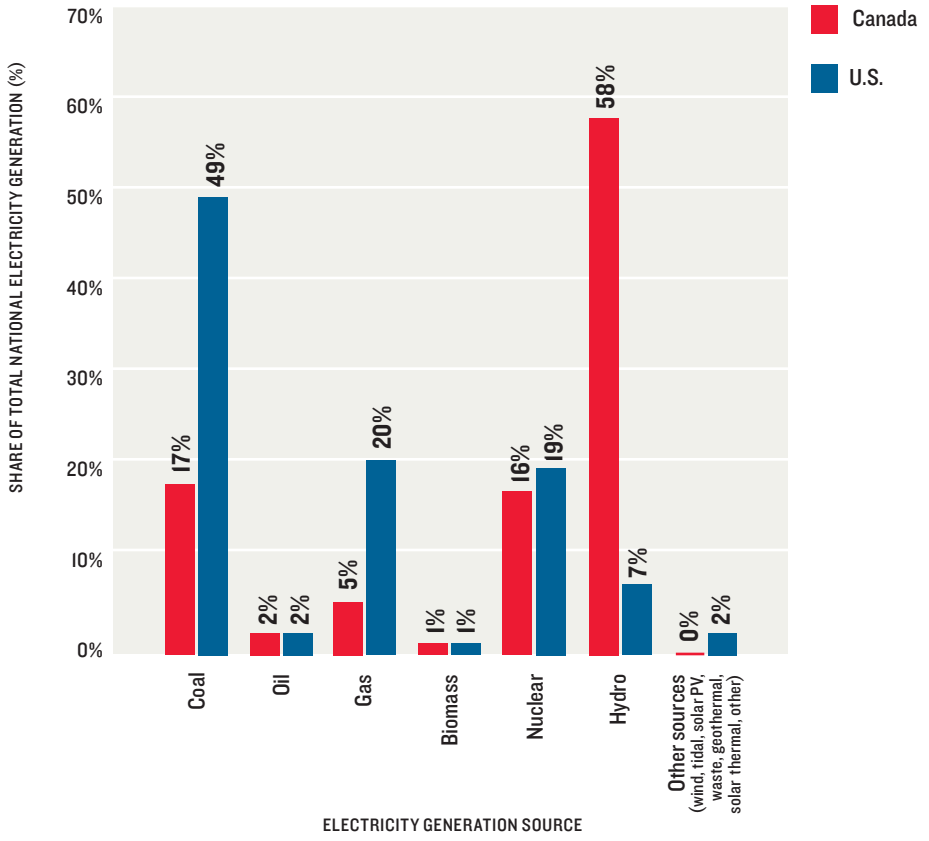


SOURCE: STATISTICS CANADA (2009, JANUARY)

Two key differences between the Canadian and U.S. economies are critical in the context of climate policy.

The first key difference lies in the composition of energy sources used for electricity generation between Canada and the U.S. As indicated in **Figure 3**, the majority of electricity generated in Canada comes from hydroelectricity. Canada is the world's second -largest producer of hydroelectricity, following China. This abundance of hydro power means that Canada is much less dependent on coal-fired power plants for electricity than many countries — the U.S. included. In the U.S., significantly more electricity comes from coal and natural gas as compared with Canada. These differences have implications for Canada-U.S. climate policy. On the one hand, electrification in Canada provides greater emission reductions due to Canada's lower emissions intensity of electricity generation. Canada's low-carbon generation provides it with a potential competitive advantage relative to the United States' fossil-fuel intensive generation. On the other hand, while moving away from emissions-intensive coal-fired electricity in the U.S. is a significant and expensive challenge, this shift would drive substantial emission reductions.

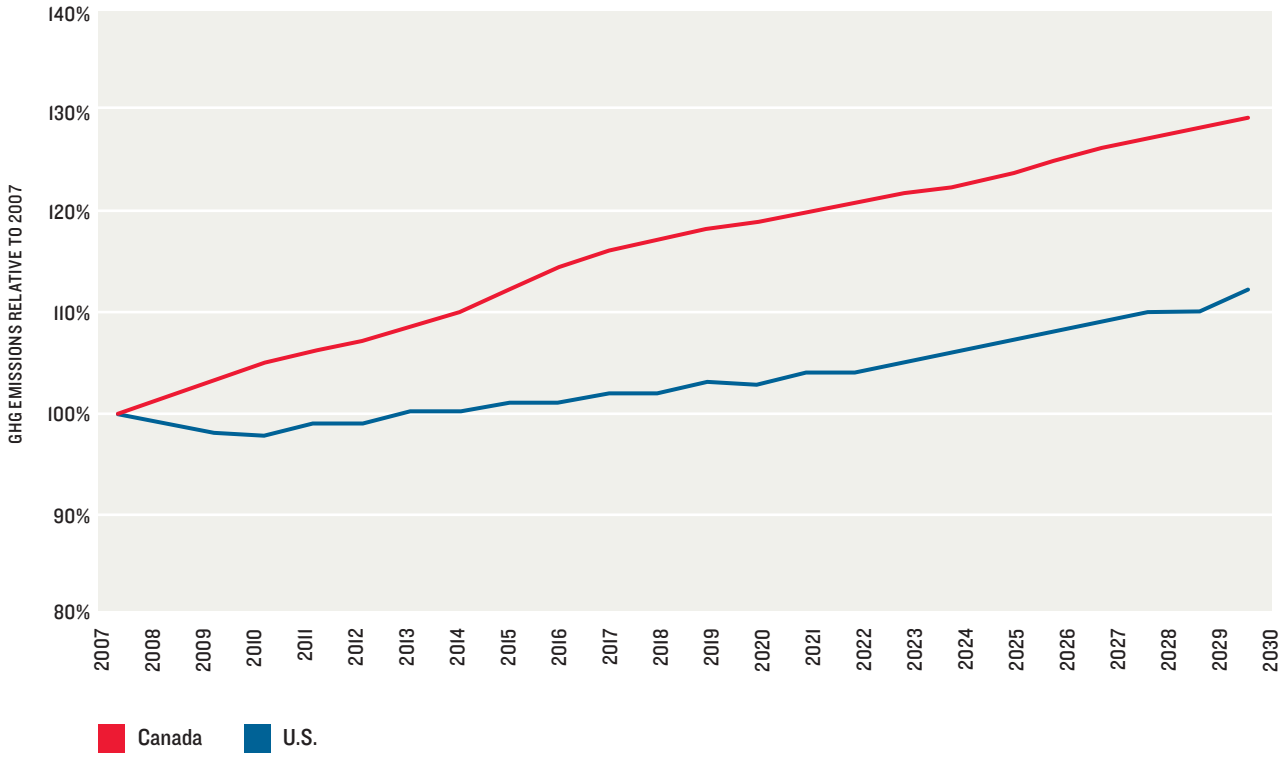
FIGURE 3 SHARE OF TOTAL ELECTRICITY GENERATION BY SOURCE FOR CANADA AND THE U.S. (2006)



SOURCE: INTERNATIONAL ENERGY AGENCY (2009).

A second key difference between Canada and the U.S. is higher projected emissions growth in Canada as shown in **Figure 4**. Relatively faster emissions growth in Canada implies a greater level of effort (and higher carbon prices) to reduce emissions and meet the stated targets for Canada relative to the United States. This difference suggests that Canada would have to reduce more emissions than the U.S. to achieve the same target relative to 2005. The costs of abatement for Canada to 2020 will depend on whether Canadian policy seeks to harmonize with the U.S. on targets or on price. We explore the issue of Canadian and U.S. marginal abatement costs in Chapter 3. These forecasts are the most recent publicly available. They may overstate the difference somewhat between the two countries as slower economic growth since 2007 has not been accounted for in the Canadian forcast from the National Energy Board, while it has for the U.S. forecast from the Energy Information Administration. This means Canadian emissions in 2020 and beyond could be lower than shown. One key difference in Canadian emissions growth is projected rapid oil sands growth.

FIGURE 4 U.S. AND CANADA GHG PROJECTIONS, 2007 – 2030 (2007 = 100%)



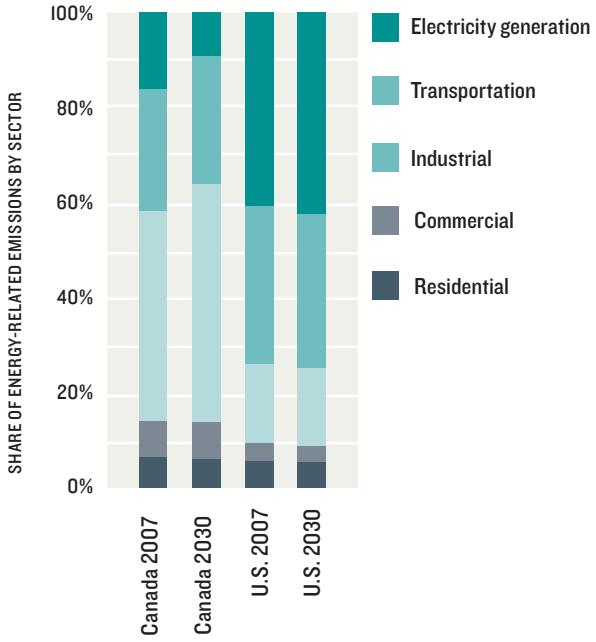
SOURCE: NATIONAL ENERGY BOARD (2007); U.S. ENERGY INFORMATION ADMINISTRATION (2009).

Sector-level differences between Canada and the U.S. parallel national differences. First, Canada's access to hydroelectric generation — as discussed above — greatly diminishes emissions from the electricity generation sector in Canada, relative to the U.S. Second, Canada's industrial emissions account for a much higher share of overall GHG emissions than do industrial emissions in the U.S.[3] This difference is partly indicative of relatively fewer emissions from electricity generation in Canada, but it also reflects the emissions intensity of Canada's industrial sectors, particularly the mining and oil and gas extraction sectors. Industrial emissions have shown strong growth in the past decade in Canada and are predicted to continue to grow in relative importance. As reflected in **Figure 5**, emissions from industry are forecast to account for nearly 50% of total GHG emissions

3 However, abundant hydro power does not necessarily translate into a common advantage across regions in Canada; it is concentrated in British Columbia, Québec, Manitoba, and Newfoundland and Labrador. In Ontario, the provincial government maintains that it will close its four coal-fired plants (Atikokan, Lambton, Nanticoke, and Thunder Bay) by December 31, 2014, citing environmental and health concerns. The government plans to replace coal-fired capacity with natural gas, nuclear, hydroelectricity, and wind, along with increased conservation measures. At present, coal provides about 16% of Ontario's electric power. In the National Energy Board's 2009 reference case, the retirement of Ontario's coal-fired facilities is offset by increases elsewhere in the country — notably, Alberta and Nova Scotia. As a result, Canada's coal-fired generation rises modestly, from about 106 billion kilowatt hours in 2006 to 128 billion kilowatt hours in 2030.

in Canada in 2030 — compared to around 15% in the U.S. Again, these differences are important in the context of climate policy: the U.S. must address emissions from coal-fired electricity, while to make comparable reductions, Canada must address emissions from a range of industrial sectors, including its emissions-intensive resource sectors.

FIGURE 5 SHARE OF ENERGY-RELATED GHG EMISSIONS BY SECTOR FOR CANADA AND THE U.S., 2007 AND 2030



SOURCE: NATIONAL ENERGY BOARD (2007); U.S. ENERGY INFORMATION ADMINISTRATION (2009).

2.2 FRAMING ISSUES: COMPETITIVENESS AND POLICY DELAY

To set the stage for our detailed analysis in the next chapter, we examine two principal issues: competitiveness and policy delay.

These issues highlight tension between environmental and economic outcomes of climate policy. *Competitiveness* represents an economic risk of moving forward with Canadian climate policy. *Policy delay* represents the environmental and economic risks of failing to do so.

COMPETITIVENESS

Competitiveness is a key economic issue in the context of Canadian and U.S. climate policy given the extensive trade integration between the two countries. Competitiveness issues arise when Canadian firms or economic sectors are comparatively disadvantaged by higher carbon costs than those borne by their competitors in the U.S. Canadian competitiveness is impacted by a range of external factors beyond its own climate policy choices, including the trade exposure and emissions intensity of Canadian sectors, differences in the Canadian emissions profile compared to the U.S., and differences in our respective energy economy profiles. Competitiveness has been cited as a major reason for Canada to implement policy only in parallel with its trading partners, and in particular the U.S.

The U.S. Waxman-Markey bill established a set of criteria to define which U.S. sectors are vulnerable to competitiveness pressures from firms that do not face comparable climate policy. First, a sector must qualify as either energy or emissions-intensive. Second, a sector must qualify as trade-exposed. (Together they are energy or emissions-intensive and trade-exposed, or EITE.) Third, these criteria are applied to manufacturing sectors, excluding the extractive sectors.

Based on the first two criteria, about 60% of Canadian industrial emissions are energy or emissions-intensive and trade-exposed (EITE) under the definition in Waxman-Markey.[4] These sectors account for about 10% of Canada's GDP.[5] A number of sectors meet the two criteria:

- Oil and gas extraction (about 3% of GDP)
- Mining (about 1% of GDP)
- Some pulp and paper sub-sectors such as pulp, paper and paperboard mills (less than 2% of GDP)
- Some chemical manufacturing sub-sectors (less than 1% of GDP)
- Cement and other non-metal mineral manufacturing (less than 1% of GDP)
- Some iron and steel manufacturing sub-sectors (less than 2% of GDP).

Appendix 7.4 illustrates how these sectors meet the EITE criteria for vulnerability to competitiveness. Under Waxman-Markey, only manufacturing sectors are eligible for EITE-related provisions, which means that oil and gas extraction and mining are not considered vulnerable under the bill. The remaining sectors listed similarly qualify as EITE in the U.S.

POLICY DELAY

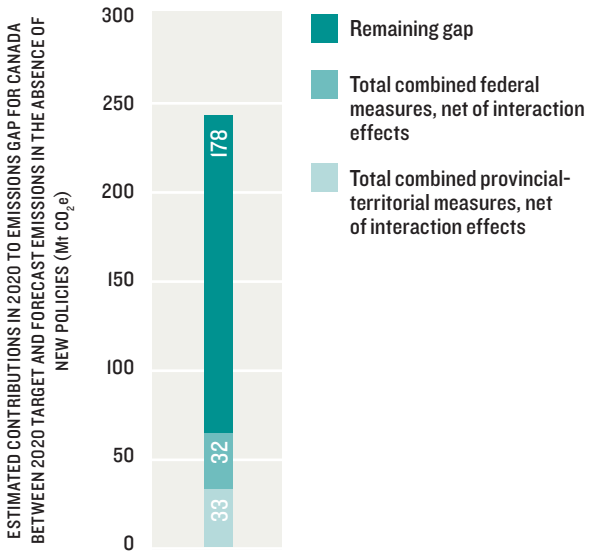
The issue for Canada, however, is not only an economic one — Canada's environmental goals are also at stake.

A market-based policy that puts a price on carbon is essential to achieving Canada's emissions reduction targets. Policies already implemented or proposed by the Government of Canada such as regulations for vehicles and for existing coal-fired electricity are important steps, but are insufficient on their own to drive down emissions from all parts of the economy. While the announced vehicle efficiency standards for cars and light trucks and the phase-out of coal-fired electricity do achieve significant reductions, they are unlikely to achieve

4 While the electricity generation sector is emission and energy intensive, it is not trade-exposed under this definition.
5 Sawyer, D. (2010).

the government's 2020 targets on their own. **Figure 6** shows the estimated emission reductions gap between expected emissions levels in 2020 and the 2020 government target.[6] This analysis, provided by Environment Canada, suggests that GHG emissions will continue to climb, and by 2020, the total gap between emissions and the 2020 target would be approximately 178 Mt. To achieve the 2020 target, additional policy steps will be required.

FIGURE 6 ESTIMATED CONTRIBUTIONS TO EMISSION REDUCTIONS IN 2020 FROM GOVERNMENT MEASURES AND REMAINING GAP



Policy delay also increases economic costs. If the delay is sufficiently long, costs must rise more sharply in a shorter time frame to achieve the targeted reductions. In its report, *Getting to 2050: Canada's Transition to a Low-Emission Future*, the NRTEE showed that delaying the implementation of policy that puts a price on carbon emissions increases the costs and reduces the political viability of achieving stated GHG emissions reduction targets within the time frames set. The NRTEE built on these findings in its follow-up

6 Based on analysis provided by Environment Canada.

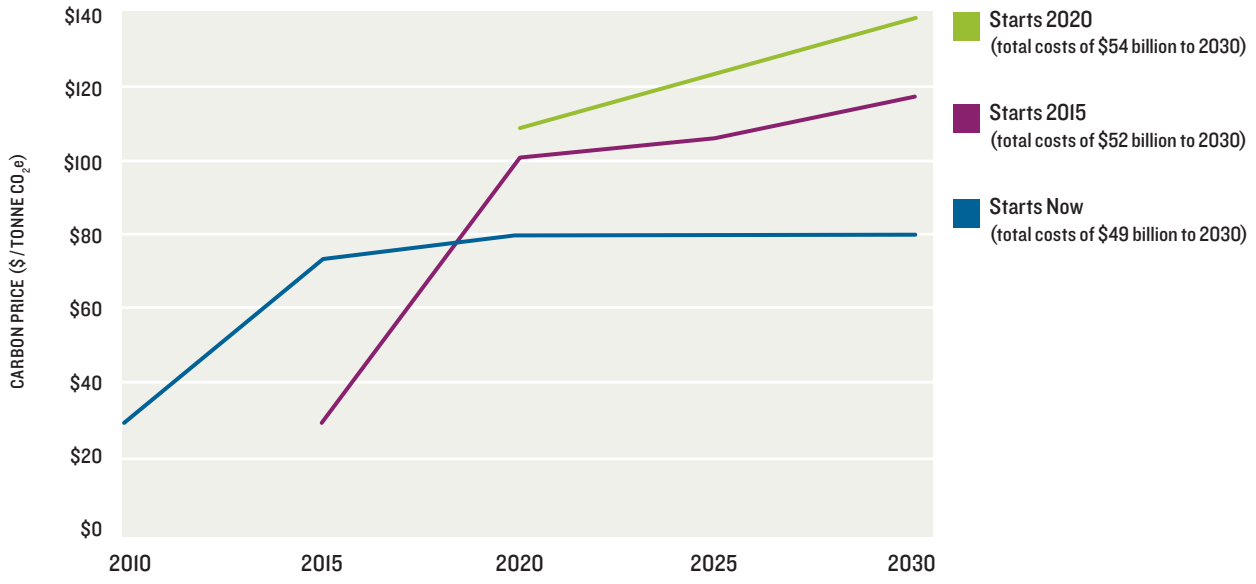
report, *Achieving 2050: A Carbon Pricing Policy for Canada*, which showed that in order to achieve GHG targets at least economic cost, the federal government should establish a clear price signal over the long term using a national, economy-wide cap-and-trade system. In the absence of certain long-term climate policy, the high annual investment in new capital, combined with an average time horizon of 10–15 years between conception and completion of new electricity-generating installations, will result in investment in lower-cost, higher-emitting technologies. Because much of this high-emissions capital has a long lifespan, it will not be replaced for many years and is therefore "locked-in." When climate policy is ultimately implemented, this lock-in will result in a decreased capacity to switch to low-emitting technologies and consequently higher carbon-policy costs to achieve emission reductions. It will be more expensive to change to low-carbon-emitting technologies and require government regulations, directives, and possibly subsidies to do so.

Updated economic modelling conducted by the NRTEE for this report highlights the risks of delaying Canadian climate policy. **Figure 7** shows the required carbon prices and costs for three scenarios that each achieve the government's target of a 17% reduction of GHG emissions below 2005 levels in 2020. Costs reflect an estimate of the added expense for emitters of their abatement choices in response to the price signal. Scenario 1 (Start Now) assumes climate policy is implemented in 2010, scenario 2 (Start 2015) assumes policy is implemented in 2015, and scenario 3 (Start 2020) assumes policy is implemented in 2020.[7] Each scenario is able to achieve the 2020 target because of the assumption that, with the policy implementation date announced significantly in advance, businesses plan and make the appropriate investments needed to hit targets. To make the assessment comparable, the cumulative amount of emission reductions is constant across the scenarios to 2030. While both the Start Now and Start 2015 scenarios begin with a $30/tonne carbon price, the total costs from the Start 2015 scenario are 6% higher than the Start Now scenario, given that the price must rise higher over a shorter period of time to achieve the 2020 target and the same level of cumulative reductions to 2030. If policy is not implemented until 2020, achieving the same level of cumulative emission reductions requires an even higher carbon price, and imposes 10% higher costs than the Start Now scenario. The total added costs of delaying 10 years relative to starting now are approximately $5 billion.[8]

7 Unlike the main analysis in this report, this modelling was performed using a reduced-form version of the CIMS model, a technologically explicit, behaviourally realistic bottom-up model. The CIMS model is useful for exploring responses of the economy over time to a carbon price trajectory, but provides only an estimate of macroeconomics and total costs (which we explore in detail in this report using the GEEM model, a computable general equilibrium model, as described in Appendix 7.3). The price trajectories were constrained to achieve both the government's 2020 target and equivalent cumulative reductions to 2030.

8 Total costs are discounted to the present at a 10% discount rate.

FIGURE 7 COSTS OF DELAY: CARBON PRICES AND TOTAL COSTS FOR THREE TIMING SCENARIOS



2.3 RESEARCH APPROACH

To explore more deeply the environmental and economic risks and opportunities for Canada from U.S. policy and from differences between Canadian and U.S. policy, the NRTEE applied a range of research tools, both qualitative and quantitative.

Our goal was to produce robust analysis that would provide new insight into the nature and size of these risks, then apply the learning from this analysis for consideration of alternative policy paths to move forward. Key research elements include the following:

// Assessment of Canada-U.S. energy, emissions, and trade characteristics and abatement cost curves

// Macroeconomic modelling of Canadian and U.S. climate and trade policy scenarios

// Assessment of implications of Canadian climate policy for linkage and alignment with U.S. policy

The starting point was Canada's GHG emission reduction targets. Canada's 2020 target has changed over the past few years. Until early 2010, Canada's 2020 target was 20% below 2006 levels. Now it is harmonized with the U.S. at 17% below 2005 levels.[9] This change of both target and baseline year (to 2005) translates into a reduction of Canada's target of about 21%. **Table 1** compares the new 2020 medium-term target with the old, as well as what this means in terms of the 1990 Kyoto Protocol baseline.

TABLE 1 COMPARISON OF CANADIAN AND U.S. GHG EMISSION-REDUCTION TARGETS

TARGET 2020	U.S. (WAXMAN-MARKEY)	CANADA (*TURNING THE CORNER*, 2007)	CANADA (POST-COPENHAGEN, 2010)
RELATIVE TO 2005 LEVELS	**17% BELOW 2005**	21% BELOW 2005	**17% BELOW 2005**
RELATIVE TO 2006 LEVELS	16% BELOW 2006	20% BELOW 2006	15% BELOW 2006
RELATIVE TO 1990 LEVELS	4% BELOW 1990	3% BELOW 1990	3% ABOVE 1990

CURRENT TARGETS IN BOLD FOR BOTH COUNTRIES.

ECONOMIC MODELLING AND SCENARIOS

The NRTEE's economic modelling approach is focused on one snapshot in time: 2020. It does not explore pathways through time through 2020; it focuses instead on policy choices and outcomes in 2020. For political decision makers and government policy makers, the

9 Environment Canada (2010, February).

short-term impacts of policy choices are most meaningful. The year 2020 is an important milestone for contemplating Canadian climate policy choices and actions. First, it is only a decade away — 10 years is not a long time to implement effective climate policy and begin to see results. Second, 2020 reflects the actual medium-term stated targets for both Canada and the U.S. and will become a benchmark against which progress will be measured. Third, 2020 represents a pivotal time frame in which Canada can make progress toward a low-carbon economy and avoid a higher-cost approach to emissions reduction with resulting economic shock if there is a need to "go further, faster."

Similar to previous reports, the NRTEE has again based its quantitative analysis on the most up-to-date modelling available. The model we used is a new version of the General Equilibrium Emissions Model (GEEM) — a computable general equilibrium (CGE) model — designed to assess the macroeconomic implications of a range of climate policy scenarios in both Canada and the U.S. The model improves on previous versions of GEEM in that it explicitly represents both Canadian and U.S. carbon policies and their impact on cross-border trade and capital movements as well as important metrics such as GDP, emission reductions, and trade surplus. Permit trade between Canada and the U.S. under an integrated Canada-U.S. cap-and-trade system is also tracked. National results are available for the U.S. with greater detail for Canada at the national, sectoral, and regional levels.[10]

We used the modelling to compare a range of policy scenarios against a reference case in which no new policies are implemented. Under the reference case, no cap-and-trade system is implemented in either Canada or the U.S.; the price of carbon is $0. Comparing policy scenarios in which different carbon-pricing policies are implemented in Canada, the U.S., or both, to this no-policy reference case allows us to isolate the impacts of these policies on emissions and on the Canadian economy. The reference case forecast implies average annual GDP growth rates to 2020 of 2.1% for Canada and 2.3% for the U.S. Based on the most recent public forecasts from both governments, it assumes Canadian emissions included in the model will increase by 10% from 2005 in 2020 to 691 Mt, and by 1% in the U.S. to 6,554 Mt. Both the Canadian and American reference case scenarios are based on macroeconomic forecasts from Informetrica Ltd.

Note that all dollar figures in this report are in 2005 Canadian dollars unless otherwise indicated.

10 See Appendix 7.3 for a more detailed explanation of the GEEM model.

DEFINITIONS FOR REFERENCE CASE AND POLICY SCENARIO

TWO TYPES OF SCENARIOS ARE RELEVANT FOR ESTIMATING EMISSION REDUCTIONS INDUCED BY POLICIES:

// The **BUSINESS-AS-USUAL** — or **REFERENCE CASE** — scenario is the forecast of emissions in the absence of additional policies.

// The **POLICY SCENARIO** is the forecast of emissions when a given policy or suite of policies is implemented.

To illustrate the policy issues and trade-offs and maintain a focus on medium-term climate-policy obligations, we have based our research and original economic modelling on the following core climate policies:

// **AN ECONOMY-WIDE CAP-AND-TRADE SYSTEM** in both countries, covering large emitters and the rest of the economy (including all energy and process emissions, but not including land-use changes and agriculture or carbon sinks such as forests), with various options to limit competitiveness risks by setting a maximum carbon price.

// **SOME LIMITED ACCESS TO INTERNATIONAL PERMIT PURCHASES** to reduce costs and maintain competitiveness, but capped to ensure some domestic reductions occur.

// **FREE PERMIT ALLOCATION TO LARGE EMITTERS** as output-based allocations in order to reflect trends toward free permits in U.S. legislative proposals, and revenue recycling to reduce both corporate and income tax. This approach would reflect a neutral distribution. Revenue is roughly distributed back to households and firms in the proportion in which it was collected. While the output-based allocations are used for our central scenarios, we explore variations on this assumption to further address regional impacts.[11]

// **TWO MAIN POLICY APPROACHES FOR THE U.S.:** An economy-wide cap-and-trade system with a cap of 17% below 2005 levels and with limited international permit choices (paralleling the system modelled for Canada as described above) and a policy consistent with both the proposed Waxman-Markey and Kerry-Lieberman bills to represent a real-world possible American climate policy framework. The Waxman-Markey real-world U.S. policy scenario includes much more substantial cost-containment in the form of domestic and international offsets, and as a result, has a lower price of carbon.

11 Similar to the NRTEE's proposal in *Achieving 2050* as well as the proposed U.S. cap-and-trade design in the Waxman-Markey and Kerry-Lieberman proposals, the cap is imposed both on large emitters and on fuel distributors in order to ensure economy-wide coverage of the program.

All policy scenarios are driven by cap-and-trade policies that impose a carbon price. We focus on carbon pricing as the primary and most cost-effective driver of climate policies in Canada and in the U.S. for several reasons. This was the conclusion of previous NRTEE reports *Getting to 2050* and *Achieving 2050*. Carbon-pricing policies continue to be policy-relevant in both countries. The Western Climate Initiative is scheduled to begin in 2012 with two states and three provinces on track for having operational trading systems. While the U.S. House of Representatives passed the Waxman-Markey bill, which contained an economy-wide cap-and-trade system, the Senate has failed to follow suit. Regulation from the U.S. Environmental Protection Agency (EPA) may prove to be the likely next federal step in the U.S. EPA regulations could apply forms of market instruments that create a carbon price signal.

Our focus on cap-and-trade in this report does not preclude the importance of other policy instruments. As we suggested in *Achieving 2050*, complementary policies and regulations in support of a carbon pricing policy can further improve the cost-effectiveness of policy by targeting sectors difficult to include under a cap-and-trade system and sectors that are slow to respond to carbon prices. Yet carbon-pricing policy is still central to achieving emission reductions at least cost. It is also central to the risks of competitiveness discussed in this report: if other jurisdictions have lower carbon prices than Canada, Canadian industry would experience a competitive disadvantage and would experience some economic impacts as a result. In assessing implications for competitiveness of different policies in Canada and the United States, carbon prices therefore are a useful and important point of comparison.

Finally, though we have chosen to frame our policy scenarios as cap-and-trade scenarios in the report, they could also be considered as more broadly representative climate-policy scenarios. Modelling scenarios with permit auctions and recycling could be considered representative of applying a carbon charge, and even scenarios with free permit allocations are comparable to a carbon charge in which significant revenue is recycled back to firms. Even a regulatory, rather than a market, approach as being considered by the Environmental Protection Agency in the U.S., is associated with an implied price on carbon. The difference in the regulatory case is that it does not apply a common, consistent carbon price across the economy as a whole, and thus may actually have higher costs due to decreased efficiency. A more stringent regulatory regime in Canada relative to the U.S. has clear parallels to a higher carbon price in Canada relative to the U.S.

As the NRTEE has stated in previous reports, there is inherent uncertainty when modelling the economic impacts of climate policy. It cannot account for independent actions or unforeseen events that might upset original parameters or change economic and financial behaviour by governments, firms, or consumers. Modelling is a very useful tool for informing policy choices but should not be treated as a precise predictor of outcomes. Instead, modelling provides its greatest value in the insights and learning that result from such quantitative analysis. Models are a representation of the real world, not a perfect copy. To provide useful insight, models use scenarios to assess choices and consider impacts. Given the high range of uncertainty surrounding American climate policy, we developed a comprehensive range of scenarios to model, and did not just rely on current legislative proposals. This amounted to eight core scenarios, with approximately 25 additional variations explored to assess specific policy options or issues, and over 100 different model runs completed. Specific details on the full range of modelling scenarios can be found in Appendix 7.5. The core scenarios are described below.

To explore key risks and opportunities for Canadian climate policy, the NRTEE scenarios focused on three main areas:

- // Key timing and harmonization risks for Canada
- // Risk management opportunities for Canada
- // A transitional policy option to manage risks and move forward in the face of continued U.S. uncertainty.

SCENARIOS TO EXPLORE TIMING AND HARMONIZATION RISKS

In the context of U.S. and Canadian climate policy, timing of policy and the relative stringency of policy are key risk drivers for Canada: What are the implications if Canada implements a policy to achieve its targets and the U.S. does not? And if both implement policies to achieve their targets, what are the implications for carbon prices in Canada and in the U.S.? We explored these issues with three illustrative scenarios: *Canada Leads*, *Canada Lags*, and *Canada Harmonizes with the U.S.* Scenarios were then parsed with considerations of "no U.S. action" for *Canada Leads*; "U.S. implements border carbon adjustments" for *Canada Lags*; and "harmonization on price" and "harmonization on targets" for *Canada Harmonizes with the U.S.* Specific scenarios are outlined in **Table 2**:

TABLE 2 SCENARIOS TO EXPLORE KEY TIMING AND HARMONIZATION RISKS FOR CANADA

These are illustrative scenarios designed to bound the possible risks and illustrate key issues for Canada in the context of uncertain U.S. policy.

SCENARIO	VARIATIONS
CANADA LAGS THE U.S.	NO POLICY IN CANADA — U.S. ACHIEVES TARGETS
	NO POLICY IN CANADA — U.S ACHIEVES TARGETS AND IMPLEMENTS BORDER CARBON ADJUSTMENTS
CANADA LEADS THE U.S.	CANADA ACHIEVES TARGETS, WITH NO U.S. ACTION BY 2020
CANADA HARMONIZES WITH THE U.S.	CANADA HARMONIZES WITH THE U.S. ON TARGETS
	CANADA HARMONIZES WITH THE U.S. ON PRICE

SCENARIOS TO EXPLORE RISK MANAGEMENT OPPORTUNITIES FOR CANADIAN CLIMATE POLICY

Scenarios modelled here explore how Canadian climate policy can be set to reduce economic and environmental risks to Canada. Specifically, they explore linking cap-and-trade systems, aligning on carbon price, and employing various permit allocation methods to recycle revenue in order to minimize competitiveness impacts on industry sectors and address regional balance concerns. Each of these can help reduce economic risks by reducing the difference between Canadian and U.S. carbon prices or by addressing regional and sectoral impacts. In turn, they give policy makers a more complete understanding of what policy choices and design options can bring. Specific scenarios are outlined in **Table 3**:

TABLE 3 SCENARIOS TO EXPLORE RISK MANAGEMENT OPPORTUNITIES FOR CANADIAN CLIMATE POLICY

These scenarios explore the implications of policy design choices Canada could make to address risks in the face of uncertain U.S. policy.

SCENARIO	VARIATIONS
LINKAGE SCENARIOS	CANADA AND U.S. ACHIEVE TARGETS WITH SEPARATE, UNLINKED CAP-AND-TRADE SYSTEMS
	CANADA AND U.S. ACHIEVE TARGETS WITH LINKED CAP-AND-TRADE SYSTEMS
PRICE-ALIGNMENT SCENARIOS	CANADA ACHIEVES TARGETS WITH NO OFFSETS[12]
	CANADA USES A SAFETY VALVE[13] TO LIMIT CANADIAN CARBON PRICE
PERMIT-ALLOCATION SCENARIOS	FREE OUTPUT-BASED ALLOCATIONS ON VALUE-ADDED BENCHMARK[14]
	FREE OUTPUT-BASED ALLOCATIONS ON EMISSIONS-INTENSITY BENCHMARK[15]
	AUCTION WITH RECYCLING MOSTLY TO INCOME TAX
	AUCTION WITH RECYCLING MOSTLY TO CORPORATE TAX
	AUCTION WITH RECYCLING TO BOTH CORPORATE AND INCOME TAX

12 *Offsets* are emission reductions created outside the cap-and-trade system. They could include international abatement opportunities or domestic reductions in emissions not covered under the cap-and-trade system (such as forestry or agriculture). See Glossary and Chapter 4 for details.

13 A *safety valve* limits the price of carbon in a cap-and-trade system. See Glossary and Chapter 4 for details.

14 *Value-added* measures the value of a sectors' output less the value of its inputs. It can represent the sector's contribution to GDP.

15 *Emissions intensity* is the number of GHG emissions produced per unit of output produced.

SCENARIOS TO EXPLORE A TRANSITIONAL POLICY OPTION FOR CANADA

The last set of scenarios has the most detailed policy assumptions. These scenarios are meant to consider the implications of a new, transitional policy option and assess whether such an option could be viable for Canada in the run-up to 2020. The option makes the Canadian carbon price contingent on the U.S. price. The scenarios consider implications both if Canada faces continued uncertain U.S. climate policy or if the U.S. implements a Waxman-Markey-like policy with an economy-wide carbon price through a cap-and-trade system and extensive offsets, which would likely keep the carbon price around $30/tonne CO_2e.[16] A transitional policy option would seek to make progress on achieving Canada's environmental goals for 2020, but also minimize the economic or competitiveness impacts along the way. While we modelled U.S. policy in these scenarios as a stylized version of Waxman-Markey, it is broadly representative as a real legislated policy for the U.S. Analyses of proposals such as Waxman-Markey, Kerry-Boxer, and Kerry-Lieberman all impose comparable carbon prices of around $30/tonne CO_2e, and are thus broadly consistent with our representative scenario.[17]

TABLE 4 SCENARIOS TO ASSESS TRANSITIONAL POLICY OPTIONS

These scenarios explore possible outcomes of the NRTEE's transitional policy option. To test policies against uncertain U.S policy, we explore outcomes both if the U.S. implements policy similar to the legislative bills being discussed and if the U.S. continues to delay.

CANADIAN POLICY	U.S. POLICY
TRANSITIONAL POLICY OPTION IF U.S. IMPLEMENTS WAXMAN-MARKEY	U.S. IMPLEMENTS WAXMAN-MARKEY, OR COMPARABLE POLICY WITH ECONOMY-WIDE CARBON PRICE, WITH SUBSTANTIAL OFFSETS TO REDUCE THE CARBON PRICE
TRANSITIONAL POLICY OPTION IF U.S. DOES NOTHING	NO POLICY IN U.S.

16 CO_2e, or carbon dioxide equivalent, is the unit used to measure combined emissions of all greenhouse gases.

17 U.S. Environmental Protection Agency, Office of Atmospheric Programs (2009); Parker, L., & Yacobucci B.D. (2009); Congressional Budget Office (2010); U.S. Environmental Protection Agency, Office of Atmospheric Programs (2010).

STAKEHOLDER ENGAGEMENT

The research scope, framing, and analysis for this report have been guided and informed by outside experts at each stage of our work. An expert advisory committee met in July and November, 2009 to give feedback on how the research was framed and what the results meant. A technical peer review panel examined our detailed analytical findings to ensure that their accuracy and characterization were valid. Two subsequent stakeholder sessions in Calgary and Ottawa in early 2010 previewed results and the transitional policy option, giving us valuable feedback on its viability. To assess American reactions and U.S. government and Congressional progress on the file, the NRTEE held a stakeholder consultation session in partnership with the Woodrow Wilson Center for Scholars in Washington D.C. in January 2010. The purpose of meeting with U.S. climate policy experts was to ensure our assumptions, analysis, and findings accurately reflected current U.S. policy and other related considerations.

ASSESSING RISKS

IN CANADA-U.S. CLIMATE POLICY

// CHAPTER 03

3.0 // ASSESSING RISKS IN CANADA-U.S. CLIMATE POLICY

3.1 // CANADA LAGS THE U.S. ON CLIMATE POLICY

3.2 // CANADA LEADS THE U.S. ON CLIMATE POLICY

3.3 // CANADA HARMONIZES WITH THE U.S. ON CLIMATE POLICY

3.4 // SUMMARY: LAG, LEAD, OR HARMONIZE?

3.0 ASSESSING RISKS IN CANADA-U.S. CLIMATE POLICY

The biggest risks for Canadian climate policy stem from U.S. climate policy uncertainty. This uncertainty complicates our own policy choices in response.

A range of legislative proposals were considered in the U.S. in 2010, including the economy -wide cap-and-trade system in the House of Representatives' Waxman-Markey bill, and the parallel Kerry-Lieberman Senate bill that proposed starting with electricity generation and transportation and phasing in large manufacturing.[18] Given that no legislation was passed, an EPA-led regulatory approach also remains a possibility.

Canada has three choices in the face of this uncertainty. It can wait until the U.S. implements some form of climate policy, it can take immediate action ahead of the U.S., or it can harmonize its policy with what is being considered in the U.S. This chapter details an assessment of both the economic and environmental risks associated with each of these three choices for Canada through three illustrative scenarios:

1. // *CANADA LAGS* THE U.S. on climate policy. In this scenario, the U.S. implements policy ahead of Canada. If Canadian policy lags, this means higher costs imposed on the U.S. economy but not on Canada's. While there are competitiveness benefits for some Canadian firms, there is a key risk of U.S. trade measures being applied to Canadian exports (in the form of border carbon adjustments) as well as the environmental risk of not achieving Canada's GHG targets.

2. // *CANADA LEADS* THE U.S. on climate policy. In this scenario, Canada implements policy ahead of the U.S. The key risk is to our economy, with likely competitiveness impacts on emissions-intensive, trade-exposed firms and specific regional economic impacts. This scenario reduces the environmental risks of not achieving emission reduction targets.

18 Other bills that have been discussed in the U.S. include the initial Senate bill, Kerry-Boxer (S. 1733), which closely resembled the Waxman-Markey bill (H.R. 2454), and the Cantwell-Collins bill (S. 2877), a simplified upstream approach that imposed a cap on upstream fuel distributers.

3 // ***CANADA HARMONIZES*** **WITH THE U.S.** on climate policy. In this scenario, Canada and the U.S. both implement policy along the same lines. At present, harmonization is occurring on targets and on some regulatory measures (vehicle emission standards). But harmonization on GHG targets is different than harmonization on carbon price and so these are assessed separately as there are economic and environmental risks to Canada of one approach over the other.

Throughout this chapter, we will assess the key economic and environmental risks to Canada for each of the three scenarios. By assessing these risks, we are then able to identify and explore possible opportunities to address these risks in the following chapter.

ECONOMIC RISKS

// ***COMPETITIVENESS RISKS*** stem from differential carbon prices between Canada and the U.S. They impact a small but important subset of our national economy that is emissions-intensive and trade-exposed.

// ***DISTRIBUTIONAL RISKS*** arise from Canadian climate policy choices. While regional and sectoral economic-impact risks are somewhat affected by relative carbon prices in Canada and the U.S., they are more strongly affected by the chosen elements of Canadian policy than whether or not the U.S. implements policy.

// ***MARKET ACCESS RISKS*** are associated with U.S. trade measures such as border carbon adjustments or a low-carbon fuel standard. These measures could pose a direct risk to Canadian exports to the U.S. by imposing additional costs on and/or limiting demand for our energy exports.

// **LONG-TERM *LOW-CARBON-ECONOMY TRANSITION RISKS*** occur when climate policy fails to drive technological change and innovation. Reducing emissions in the Canadian economy will become more expensive to accomplish and more difficult to achieve. Further, Canadian industry will be less well positioned to compete in large emerging global markets for low-carbon technologies and services.

ENVIRONMENTAL RISKS

// THERE IS A *TARGET ACHIEVEMENT RISK* with Canada not realizing its stated 2020 emission reductions target. This risk is largely a function of Canadian policy choices since more stringent domestic policy results in more GHG reductions, but if U.S. uncertainty leads to Canadian delay, then this outcome is inevitable.

// THERE IS A *CUMULATIVE EMISSION RISK*. That is, the longer significant action to reduce emissions is delayed, a greater amount of emissions contributed by Canada accumulates in the atmosphere and remains there for a longer period of time.

To assist in this analysis, we have created a Canada-U.S. Climate Policy Risk Matrix to illustrate which risks arise from each scenario. In order to present as comprehensive an illustration of risks as possible, we have taken a two-step approach — first, we analyzed the magnitude of the impacts of each risk and second, we analyzed the likelihood of the risk within each scenario.[19] The risk matrices in this chapter show the combined results of both steps. Each source of risk is assessed as *very low*, *low*, *moderate*, or *high* to give a full range of possibilities that could ensue. Although no scenario is entirely risk-free, our quantitative and qualitative analysis allows us to characterize these risks and to identify policy choices for Canada that offer the narrowest range of risks or those that could be the most manageable. **Figure 8** illustrates this framework. We populate the framework by assessing risks through the remainder of this chapter.

19 See Appendix 7.2 for the full breakdown of this analysis.

FIGURE 8 THE CANADA-U.S. CLIMATE POLICY RISK MATRIX

RISKS	ECONOMIC RISKS				ENVIRONMENTAL RISKS	
	COMPETITIVENESS	DISTRIBUTIONAL	MARKET ACCESS	LOW-CARBON TRANSITION	TARGET ACHIEVEMENT	CUMULATIVE EMISSIONS
CANADA LAGS						
CANADA LEADS						
CANADA HARMONIZES ON TARGETS						
CANADA HARMONIZES ON PRICE						

3.1 CANADA LAGS THE U.S. ON CLIMATE POLICY

This section explores the implications for Canada from both environmental and economic perspectives of lagging behind the U.S. on implementing climate policy.

It assesses impacts on the Canadian economy of U.S. policy from the perspective of competitive advantage, decreased growth in the U.S., and border carbon adjustments.

ENVIRONMENTAL RISKS

With no Canadian climate policy, Canadian emissions continue to grow to about 10% above 2005 levels in 2020, significantly higher than Canada's target of 17% below 2005 levels. As we have shown, existing policies at this stage are insufficient to achieve Canada's current emission-reduction targets.[20]

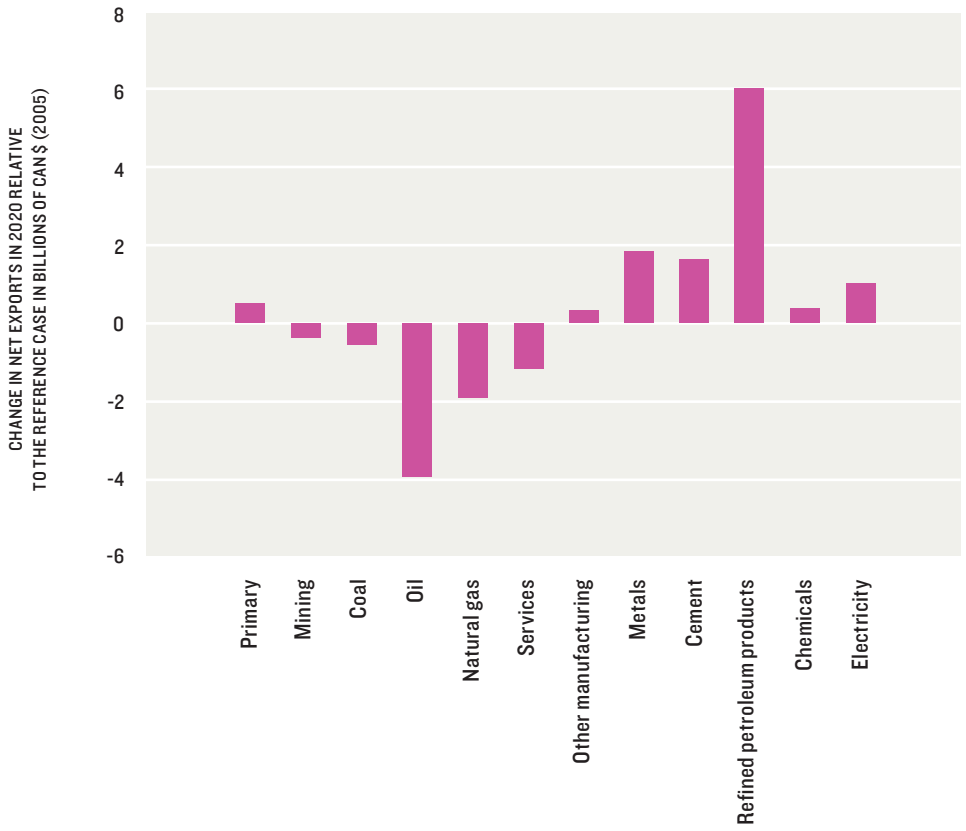
20 See Figure 6 on page 39, which illustrates the estimated reductions from Environment Canada from announced government policies.

A further environmental risk emerges for long-term reductions. If Canada lags on climate policy, firms have no expectations of the long-term value of carbon and will fail to invest in necessary low-carbon technology choices or innovation. While less-stringent Canadian policy reduces economic impacts in the short term, it stimulates less innovation and commercialization of new low-carbon technologies, essential both for achieving long-term targets as well as for being competitive in a future carbon-constrained global market. Achieving the deeper longer-term emission reductions required to meet targets becomes more difficult because they become more expensive. Not addressing Canadian emissions thus creates the obvious but real environmental risks of missing targets and of increased cumulative GHG emissions as a result.

ECONOMIC RISKS

With U.S. climate policy only (and presuming no countervailing border measures), the NRTEE modelling suggests that Canada's overall trade surplus would likely increase as Canadian goods become less expensive to U.S. buyers. U.S. climate policies would necessarily increase energy costs and subsequently the price of U.S. goods, and in the absence of comparable policies in other countries, could disadvantage domestic producers in U.S. markets. Our modelling results, as illustrated in **Figure 9**, show that Canadian exports of metal, cement, chemicals, and refined petroleum products would increase as a result of this advantage. Yet this gain is partly offset by dampened demand in the U.S. for emissions -intensive exports. Our analysis suggests that a U.S. climate policy would trigger a decline in demand as the American economy contracts in response. Exports of some products — such as oil and gas, coal, and mining products — fall in the Canada Lags scenario forecast, which then lowers Canada's national income in 2020 by about 0.2% of GDP. **Table 5** shows these national results.

FIGURE 9 CHANGES IN NET EXPORTS TO THE U.S. FROM CANADA UNDER THE *CANADA LAGS* SCENARIO



BORDER CARBON ADJUSTMENTS (BCAs)

// **BORDER CARBON ADJUSTMENTS (BCAs)** are an approach to addressing competitiveness issues through requiring imported goods from jurisdictions without a carbon pricing policy to pay for their un-priced carbon emissions costs, and/or relieving exports of their expected emissions costs. Their aim is to "level the playing field" for firms either in domestic or international markets. Our analysis focuses primarily on U.S. import tariffs, represented in the Waxman-Markey bill as International Allowance Reserves, a form of BCAs.

To protect against sectors in other countries having a competitive advantage over comparable U.S. sectors under climate policy, the U.S. could very likely implement trade measures, like Border Carbon Adjustments (BCAs), as part of its climate policy. Canada's extensive trade with the U.S. could be vulnerable to these measures on two counts: if we lagged behind the U.S. on climate policy or if our own policy were less stringent than U.S. policy.

Though the specific nature of border measures are uncertain, emerging U.S. climate policy proposals, including the American Clean Energy and Security Act (Waxman-Markey bill), the Clean Energy Jobs and American Power Act (Kerry-Boxer bill), and the American Power Act (Kerry-Lieberman bill) provide a useful lens through which to view trade risks for Canada. All three proposals contain provisions to impose costs on certain imported products from countries with comparable carbon policies. If Canadian policy was not deemed comparable, such trade measures would impose additional costs on Canadian exports. Canadian firms from sectors identified as vulnerable in the U.S. bills[21] would be subject to BCAs if they are not subject to climate policy comparable to their counterparts in the U.S.

Each of the bills includes provisions for BCAs in the form of an Import Allowance Reserve (IAR).[22] This mechanism would require importers of goods from those same designated manufacturing sectors to purchase U.S. emissions allowances to offset the carbon footprints of their products.[23] However, BCAs would only be implemented if the first line of defence for vulnerable industry — free permit allocations for emissions-intensive and trade-exposed sectors, designed to act like a subsidy for these sectors — were deemed insufficient. This constraint on U.S. importers is meant to correct any remaining carbon-cost discrepancy relative to industry in jurisdictions without comparable policy.

Exemption from border measures is offered to countries party to a multilateral climate agreement along with the U.S. with policies of comparable stringency — or if the imported goods are less carbon intensive than their U.S. counterparts, which may be achieved with less stringent policy. Under the Kerry-Lieberman bill, border carbon adjustments could only be applied after 2020 if no international climate agreement is in place. U.S. policy has been designed with emerging economies, such as China and India, more in mind than Canada, but the popularity of border measures among key U.S. constituencies leads to uncertainty and risk for Canada in how the provisions will be incorporated and ultimately applied.

21 As discussed in Chapter 2, the Waxman-Markey bill identifies those U.S. sectors with potential competitiveness risks deemed to be emissions-intensive and trade-exposed (EITE). Oil and refined petroleum products are excluded under the EITE designation.

22 The IAR is defined in the American Clean Energy and Security Act of 2009, H.R. 2454, section 768.

23 The Kerry-Boxer bill (S.1733) does not contain specific detail for an IAR, however a place-holder in Section 765 states that, "It is the sense of the Senate that this Act will contain a trade title that will include a border measure that is consistent with our international obligations and designed to work in conjunction with provisions that allocate allowances to energy-intensive and trade-exposed industries." See the Clean Energy Jobs and American Power Act of 2009, S. 1733, section 765.

To assess the full range of Canadian exposure to American BCAs and what its maximum impact could be, we considered the implications of a border carbon adjustment on all Canadian exports, not just those from sectors identified by the U.S. bills as vulnerable to competitiveness risks. The results, therefore, likely overstate impacts. The adjustment was made based on the carbon intensity of Canadian exports. The BCA level was illustrated as the U.S. carbon price applied to a specific industry.

The results are presented in **Table 5**. Economic growth is positive, but slightly less than it would have been in the absence of the policy as a result of dampened U.S. demand. Not surprisingly, Canadian exports are negatively affected if the U.S. applies border carbon adjustments equivalent to the U.S. carbon price. Canada's trade surplus with the U.S. is reduced by approximately $300 million in 2020, although not eliminated, if the U.S. implements BCAs. The border adjustment decreases the gains Canada would experience under the main Canada Lags scenario. Overall, Canada's trade surplus with the U.S. still increases relative to the reference case, even with the BCAs.

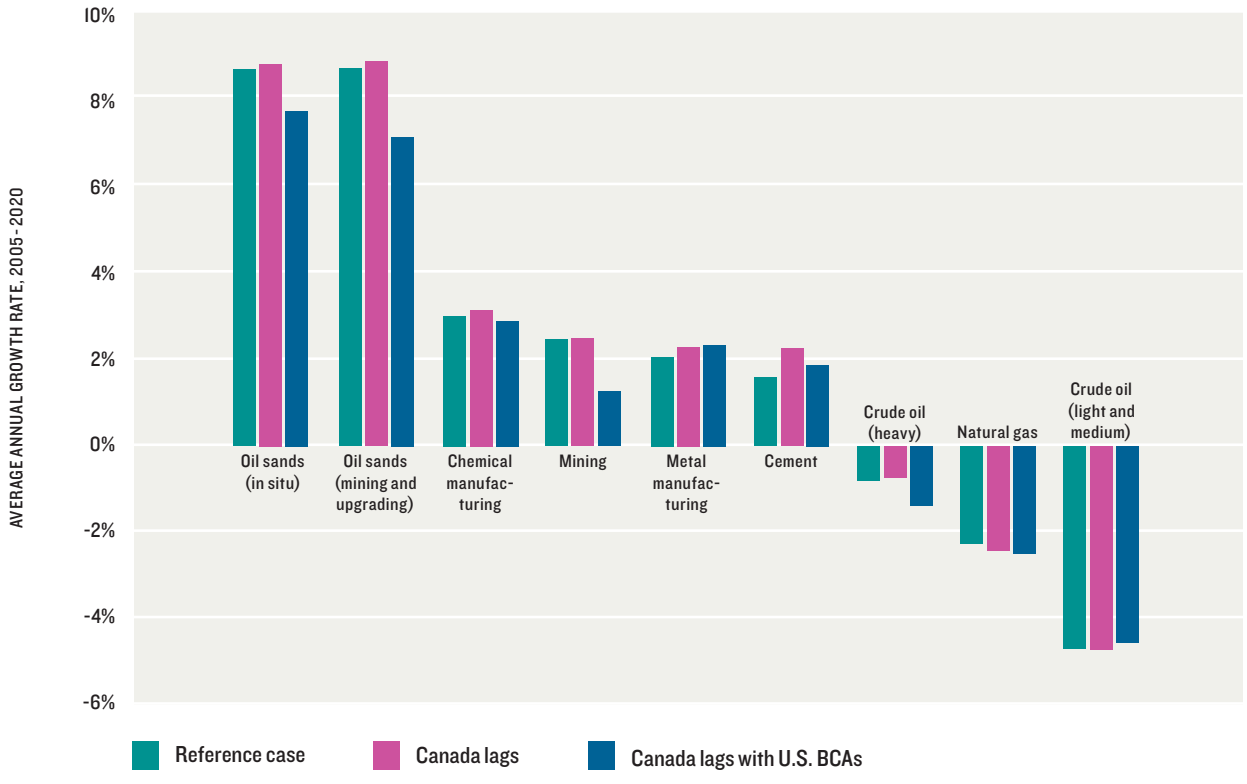
TABLE 5 ECONOMIC RISKS OF *CANADA LAGS* SCENARIOS

CANADA LAGS SCENARIOS[24]	CARBON PRICE IN 2020 ($/TONNE)		CANADIAN GDP IMPACTS		INCREASE IN TRADE BALANCE FOR CANADA IN 2020 RELATIVE TO REFERENCE CASE ($ BILLIONS)
	CANADA	U.S.	AVERAGE ANNUAL GDP GROWTH TO 2020 (REFERENCE CASE IS 2.1%)	% CHANGE IN GDP IN 2020 RELATIVE TO REFERENCE CASE	
U.S. HITS 2020 TARGET, BUT DOES NOT APPLY BCAs	$0	$52	2.0%	-0.2%	$6.0
U.S. HITS 2020 TARGET AND APPLIES BCAs TO ALL CANADIAN GOODS	$0	$51	2.0%	-0.2%	$5.7

24 In these scenarios, Canada implements no policy. The U.S. implements a cap-and-trade system to achieve its 2020 target of 17% below 2005 levels, with 20% of its compliance coming from international permits. We model U.S. policy as this simplified economy-wide cap-and-trade system so as to have a common point of comparison across the Canada Lags, Canada Leads, and Canada Harmonizes scenarios. Permits to large emitters are allocated for free as *output-based allocations* in order to reflect trends toward free permits in the U.S. The rest of the economy is covered through an upstream cap with permit auction and revenue recycling 50% to corporate and 50% to income tax. This split reflects a neutral distribution; revenue is roughly distributed back to households and firms in the proportion in which it was collected. Note that this scenario is illustrative, and is not an exact replication of the Waxman-Markey bill, or any other specific proposed legislation. It does not include the same level of offsets proposed in the Waxman-Markey bill, and so has a higher carbon price. In the second scenario, the border carbon adjustment (BCA) imposes the same carbon price on all Canadian exports to the U.S. Again, this BCA scenario is more severe than the more limited one proposed in Waxman-Markey. It is intended to better represent the worst-case scenario.

Some Canadian sectors are affected by the BCAs more than others. **Figure 10** illustrates the sectoral impacts of American BCAs on the Canadian trade-exposed and emissions-intensive sectors. Oil and mining sectors show the biggest impacts under this scenario.[25] **Figure 10** shows that the impacts of a U.S. BCA are not uniform at a sector level; while the national economic growth rates are not appreciably affected by the BCA, some sectors show clear reductions in growth.

FIGURE 10 AVERAGE ANNUAL GROWTH RATES 2005–2020 FOR CANADIAN EMISSIONS-INTENSIVE AND TRADE-EXPOSED SECTORS UNDER *CANADA LAGS* SCENARIOS (WITH AND WITHOUT U.S. BCAs)



A LOW CARBON FUEL STANDARD (LCFS)

// A LOW CARBON FUEL STANDARD (LCFS) is a regulation that mandates a decreasing carbon content in the total pool of transportation fuels.

25 Again, note that under the Waxman-Markey bill, oil is not an eligible sector under the BCAs, though it is included here to represent the worst-case scenario.

Low carbon fuel standards (LCFS) pose a similar risk as BCAs but for different reasons. LCFS requires that the carbon content of transportation fuels meet a minimum standard. The intent of LCFS is to reduce dependence on imported oil and reduce carbon emissions. A LCFS is designed to encourage biofuels in the transportation sector, but will also likely be a disincentive for fuel refined from more carbon-intensive sources such as the oil sands. The economic risk for Canada is a reduction of export revenue from oil, and from oil produced from oil sands in particular, given its relatively high carbon content as compared to conventional oil. While there is currently no national LCFS in the U.S., it has been discussed, and some states are proceeding in this direction, with California implementing a LCFS.

A recent report from Ceres, a U.S. think tank,[26] finds that more than half of the U.S. states and four Canadian provinces are weighing the adoption of LCFS to reduce the carbon intensity of some petroleum fuels. In particular, the report identifies emerging low-carbon fuel standards in the U.S. as jeopardizing Canadian fuel from oil sands production to long-term access to the U.S. market.[27] California's LCFS requires a 10% reduction in the average carbon intensity of motor vehicle fuels by 2020. States in the northeast may soon follow suit. Together, these states comprise one-quarter of U.S. demand for transportation fuels. Adoption of LCFS would place oil sands producers at a disadvantage to conventional petroleum producers, because their synthetic crude oil is around 12% more carbon intensive than average crude oil. That means oil sands suppliers would need to achieve a 20% total reduction in carbon intensity over the next decade in order to meet the average regain under an LCFS based on the California standard.

The Ceres report concludes that the adoption of an LCFS would have a negative impact on projected oil sands production under any scenario considered. For example, it suggests that a U.S. federal standard seeking a 20% reduction in the carbon intensity of transportation fuels could result in a 33% reduction in oil sands production relative to projected growth. The analysis does not consider how alternative markets for oil-sand products (potentially enabled through a future pipeline to the Pacific) could mitigate these impacts.

26 RiskMetrics Group (2010). Report commissioned by Ceres.

27 More than half of U.S. states and four Canadian provinces are weighing adoption of LCFS to reduce the carbon intensity of some petroleum fuels.

Finally, lagging behind the U.S. in climate policies will hinder the development and deployment of new low-carbon technologies. As other nations around the world implement climate policies, new markets will emerge for low-carbon goods and services. Canada will be less well-positioned to compete in these markets and to seize these new opportunities without domestic climate policy, including a carbon pricing policy.[28]

Figure 11 qualitatively summarizes our combined assessment of the economic and environmental risks if Canada were to lag behind the U.S. on climate policy. Certain Canadian industries would experience competitive advantage relative to the U.S., though economic risks from U.S. trade measures would partially offset these gains. Therefore, while competitiveness and distributional risks are very low, market access risks are moderate. Canada would also face long-term economic risks from higher costs of reducing emissions given delays in Canadian policy. Lagging would also delay Canada's transition to a low-carbon economy and development of innovative low-carbon technologies. Similarly, it faces clear environmental risks in terms of achieving both short- and long-term reductions. Therefore, the risks of not achieving targets and greater cumulative emissions for Canada are high.

FIGURE 11 RISKS FOR CANADA UNDER *CANADA LAGS* SCENARIO

RISKS	ECONOMIC RISKS				ENVIRONMENTAL RISKS	
	COMPETITIVENESS	DISTRIBUTIONAL	MARKET ACCESS	LOW-CARBON TRANSITION	TARGET ACHIEVEMENT	CUMULATIVE EMISSIONS
CANADA LAGS	VERY LOW	VERY LOW	MODERATE	HIGH	HIGH	HIGH

28 The NRTEE has begun to explore this issue in the recent report *Measuring Up: Benchmarking Canada's Competitiveness in a Low-carbon World.* (NRTEE, 2010). It will explore this issue in even more detail in the sixth report of the *Climate Prosperity* series.

3.2 CANADA LEADS THE U.S. ON CLIMATE POLICY

This section explores the implications for Canada of leading the U.S. on climate policy. It assesses environmental and economic outcomes if Canada implements climate policy while the U.S. does not.

If Canada were to implement climate policy ahead of the U.S., it would face economic impacts from its own policy. However, implementing more stringent policy in Canada, whether ahead or at the same time as the U.S., reduces the risk of U.S. border carbon adjustments. It also reduces the environmental risk associated with missing GHG emission reduction targets.

ENVIRONMENTAL RISKS

Canada's risks of missing its 2020 GHG targets are eliminated in a Canada leads scenario. The risk of not being positioned for long-term emission reductions is also avoided, as Canadian policy would drive low-carbon investment and innovation.

ECONOMIC RISKS

If Canada were to move first and lead the U.S. in implementing climate policy in order to achieve our 2020 targets, Canadian firms would face greater costs leading to some competitiveness risks. To assess the economic and competitiveness implications of leading the U.S. on policy, the NRTEE explored scenarios where Canada's emissions are reduced to 17% below 2005 levels in 2020 while no emission reductions are imposed in the U.S.

Table 6 illustrates key economic outcomes under this scenario. Moving ahead of the U.S. would result in higher carbon prices in Canada than in the U.S. The Canadian carbon price to meet our 2020 target alone emerges at about $74/tonne.[29] Under this scenario, Canada still experiences positive GDP growth, but total GDP in 2020 is about 2.0% lower than the reference case, or what it would have been in 2020 without any new carbon price and climate policy. Net exports decrease by $5 billion in 2020 (29%), suggesting competitiveness issues for emissions-intensive and trade-exposed sectors is significant. Shifts of investment also occur, as capital seeks higher returns in the U.S.

29 With 20% international offsets allowed.

TABLE 6 ECONOMIC RISKS OF *CANADA LEADS* SCENARIO

CANADA LEADS SCENARIO[30]	CARBON PRICE IN 2020 ($ / TONNE)		CANADIAN GDP IMPACTS		INCREASE IN TRADE BALANCE FOR CANADA IN 2020 RELATIVE TO REFERENCE CASE ($ BILLIONS)
	CANADA	U.S.	AVERAGE ANNUAL GDP GROWTH TO 2020 (REFERENCE CASE IS 2.1%)	% CHANGE IN GDP IN 2020 RELATIVE TO REFERENCE CASE	
CANADA HITS 2020 TARGET NO POLICY IN U.S.	$74	$0	1.9%	-2.0%	$-5.3

Competitiveness risks for Canada of leading are concentrated in the vulnerable emissions-intensive and trade-exposed sectors. **Figure 12** shows impacts on GDP growth on these key Canadian sectors relative to the reference case. Resource extraction sectors again show the biggest impact, though it is important to note that all sectors that were forecast to grow in the reference case continue to grow under the Canada Leads scenario. The oil sands sectors in particular are still forecast to grow at rates of 6–7% per year under this scenario,[31] well above the national average economic growth rate of 1.9%. The net effect of the Canadian policy on national economic activity, however, would lower Canadian GDP further, and include some additional regional risk given the concentration of oil and gas in Western Canada.

30 In this scenario, Canada implements a cap-and-trade system to achieve its 2020 target of 17% below 2005 levels, with 20% of its compliance coming from international permits. Permits to large emitters are allocated for free as output-based allocations. Both of these measures allow for some financial easing on firms. The rest of the economy is covered through an upstream cap with permit auction and revenue recycling 50% to corporate and 50% to income tax. The U.S. implements no policy, so has a carbon price of zero.

31 This growth rate is consistent both with historical rates and other growth forecasts. See Canadian Association of Petroleum Producers (2010).

FIGURE 12 AVERAGE ANNUAL GROWTH RATES FOR CANADIAN EMISSIONS-INTENSIVE AND TRADE-EXPOSED SECTORS, 2005–2020 UNDER THE *CANADA LEADS* SCENARIO

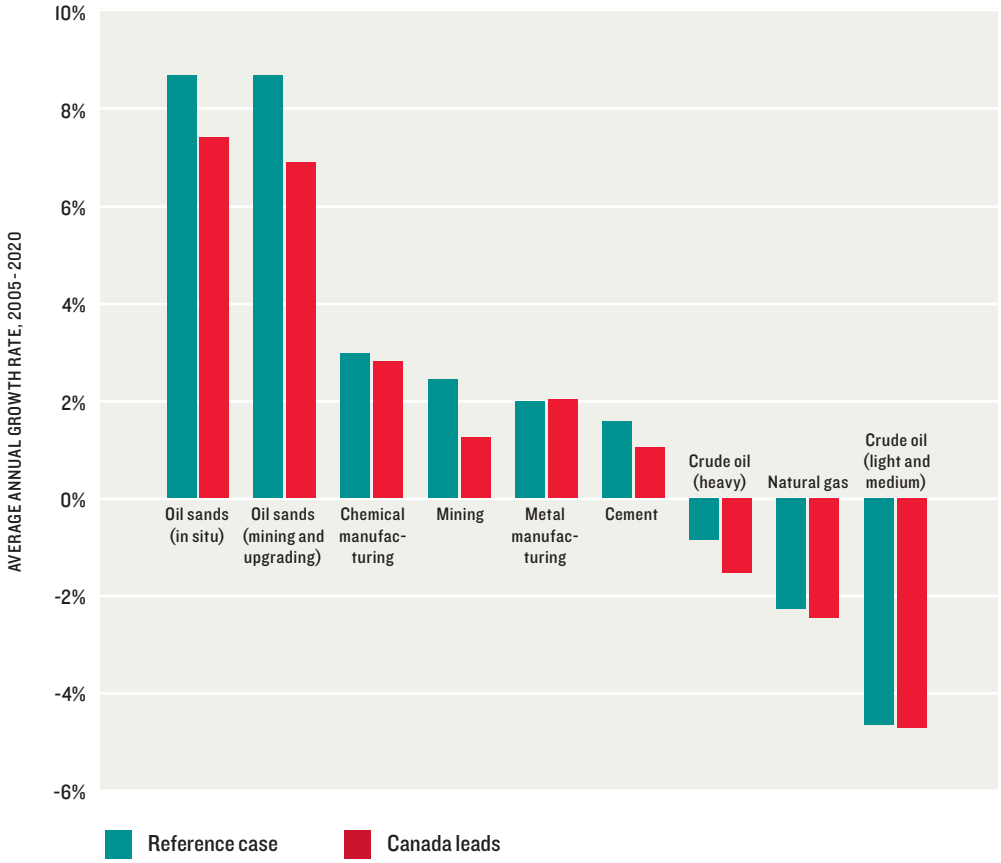


Figure 13 qualitatively summarizes our assessment of environmental and economic risks if Canada were to lead the U.S. on climate policy. Under the Canada Leads scenario, Canada would face moderate but real economic competitiveness risks. While national impacts of competitiveness on economic growth are likely to be small relative to the reference case, specific regions and sectors would bear the largest risk of economic impact, both from the costs of competitive disadvantage relative to the U.S. and from the costs of reducing emissions in Canada. Market access risks in the form of border carbon adjustments are eliminated in a Canada leads scenario. Unlike U.S. border carbon adjustments, a LCFS would have economic implications for Canada even if strong Canadian policy

were implemented. However, Canadian climate policy could drive some improvements in the emissions intensity of the oil sands sector, thus sheltering it from impacts of an LCFS in the longer term. The risk associated with the costs of long-term reductions is lowered, placing Canada on a low-carbon transition path and positioning it to potentially develop and export new low-carbon technologies. Risks of not achieving GHG reduction targets are addressed as Canada takes steps to position itself for long-term GHG emission reductions.

FIGURE 13 RISKS FOR CANADA UNDER *CANADA LEADS* SCENARIO

3.3 CANADA HARMONIZES WITH THE U.S. ON CLIMATE POLICY

This section explores the implications of Canada and the U.S. pursuing parallel climate policies with the aim of harmonizing on GHG reduction targets or on carbon price. This section does not include linkage scenarios, which are explored in the following chapter as possible tools to address the risks highlighted in this chapter.

As seen, Canada has already harmonized GHG emission-reduction targets with the U.S. as well as vehicle emissions standards for new cars and light trucks. Yet Canada has signalled its intent to phase out coal-fired electricity plants starting in 2015, independent of

the U.S. Competitiveness has been cited as a key reason Canada should harmonize its climate policy with trading partners and specifically with the U.S. However, harmonizing with the U.S. is not straightforward. As we will see, Canada cannot easily achieve the same levels of emission reductions at the same carbon price as the U.S. Different approaches to harmonization therefore result in different environmental and economic outcomes.

ENVIRONMENTAL RISKS

Harmonizing Canadian climate policy with the U.S. generally reduces environmental risks for Canada, if the U.S. implements a similar cap-and-trade system. Harmonized 2020 targets in Canada and the U.S., with a carbon price in both countries, would lead to emission reductions in Canada. This action would, in turn, set the stage for deeper reductions in the long term. Harmonizing on carbon price with the U.S., by contrast, does not lead to the full, stated 2020 emission reductions due to differences in the cost of carbon abatement in Canada. A higher carbon price is required in Canada to achieve the same level of domestic emission reductions. So, Canada risks not achieving its targets if a harmonized carbon-pricing policy is pursued rather than a harmonized GHG-target policy.

ECONOMIC RISKS

Economic risks to Canada of harmonization depend in large part on the nature of Canada-U.S. climate policy harmonization. Current federal government policy is to harmonize on targets. Our analysis below demonstrates that this approach requires a carbon price differential that could pose certain competitiveness risks. So, common carbon-reduction targets do not result in common carbon prices. Harmonization on carbon price tends to reduce economic impacts by addressing competitiveness risks, but does not eliminate impacts. And, as we illustrate in **Table 7**, it raises environmental risks of not achieving similar levels of emission reductions for the two countries. Our analysis shows that, overall, Canada's own GHG mitigation policy and the resulting emission reductions in the Canadian economy are the single-largest determinant of economic impact in Canada.

HARMONIZING CARBON PRICES AND TARGETS

NRTEE modelling considered the environmental and economic impacts of harmonizing on targets and on prices in detail. Key results are set out in **Table 7**.

TABLE 7 ECONOMIC AND ENVIRONMENTAL IMPACTS OF HARMONIZING CARBON TARGETS AND PRICE WITH THE U.S.

CANADA HARMONIZES SCENARIOS[32]	DOMESTIC ABATEMENT BY 2020		CARBON PRICE IN 2020 ($ / TONNE)		CANADIAN GDP IMPACTS	
	CANADA	U.S.	CANADA	U.S.	AVERAGE ANNUAL GDP GROWTH TO 2020 (REFERENCE CASE IS 2.1%)	% CHANGE IN GDP IN 2020 RELATIVE TO REFERENCE CASE
CANADA HARMONIZES ON TARGETS (17% BELOW 2005)	-14%	-14%	$78	$54	1.9%	-2.3%
CANADA HARMONIZES ON CARBON PRICE	-8%	-14%	$54	$54	1.9%	-1.6%

Differences between the costs of abatement in Canada and in the U.S. explain the results in this table. Setting matching targets with matching levels of reductions to be achieved will likely result in significantly different carbon prices — and they will be higher for Canada. With both countries achieving reductions of 14% below 2005 levels by 2020 in terms of domestic emissions (the remainder — to get to 17% below 2005 — is made up from international purchases of permits, which helps keep domestic costs down), NRTEE modelling suggests Canada would have a price of $78/tonne CO_2e, while the U.S. would have a price of $54/tonne CO_2e.

On the other hand, aligning carbon prices would result in different domestic reductions. For example, if Canada were to match the U.S. carbon price of $54/tonne CO_2e, it would achieve only an 8% reduction domestically — less than half its stated target — while the U.S. would achieve close to a 14% reduction from 2005 levels. Matching price then, would impact Canada's ability to achieve its emission-reduction targets. Canada would then have to look to other options to make up the shortfall to reach its 17% target, such as access to international permit markets. There are costs to these options also, which we assess later.

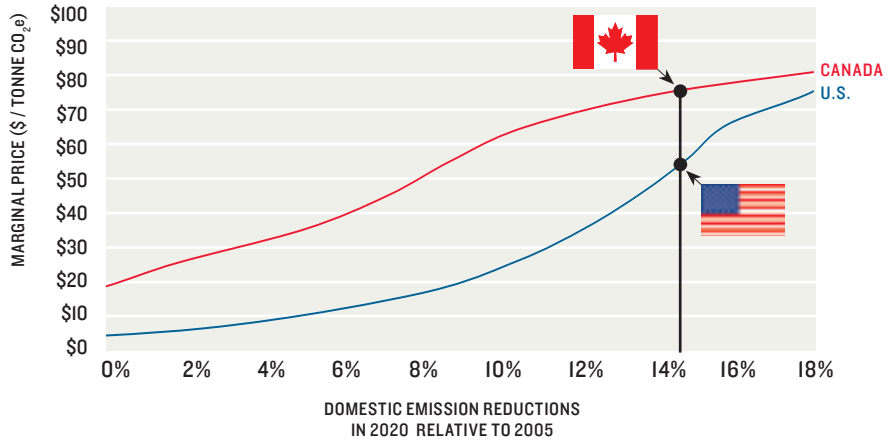
32 In these scenarios, the U.S implements a cap-and-trade system to achieve its 2020 target of 17% below 2005 levels, with 20% of its compliance coming from international permits. We model U.S. policy as this simplified economy-wide cap-and-trade system so as to have a common point of comparison across the Canada Lags, Canada Leads, and Canada Harmonizes scenarios. Permits to large emitters are allocated for free as output-based allocations in order to reflect trends toward free permits in the U.S. The rest of the economy is covered through an upstream cap with permit auction and revenue recycling 50% to corporate and 50% to income tax. This split reflects a neutral distribution; revenue is roughly distributed back to households and firms in the proportion in which it was collected. In the first scenario, Canada implements comparable policy to achieve the same targets. In the second, the Canadian carbon price is constrained to match the U.S. carbon price, resulting in fewer percent emission reductions in Canada relative to the U.S. relative to 2005 emissions.

The challenges behind harmonizing on both carbon price and emission-reduction targets are illustrated in **Figure 14**. This figure is derived from original NRTEE modelling. The marginal abatement cost (MAC) curves shown in the Figure illustrate the incremental cost for reducing one tonne of CO_2e emission. They can also be understood as the reductions that will occur as result of policy that imposes a price on carbon. At low levels of reductions, the Canadian curve is higher than the U.S. curve given the higher rate of emissions growth projected for Canada: if no policy to price CO_2 was imposed, emissions in Canada would just increase. This result is broadly consistent with other economic analyses.[33] Both cost curves begin to level off at higher marginal prices as the electricity generation sectors switch from coal to a range of low-carbon generation approaches. The differences between the Canadian and U.S. curves indicate that harmonizing on targets leads to different carbon prices while harmonizing on carbon price leads to different emission reductions.

33 Clapp, C., Karousakis, K., Buchner, B., & Chateau J. (2009), and Morris J., Paltsev S., & Reilly J (2008).

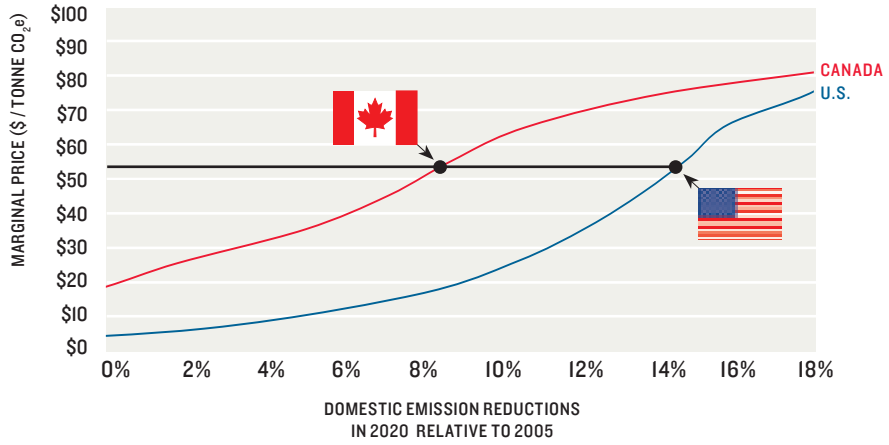
FIGURE 14 HARMONIZING ON TARGETS VS. PRICE: MARGINAL ABATEMENT COST CURVES FOR CANADA AND THE U.S.

FIGURE 14 a Canada harmonizes on targets with U.S. — Canada pays more



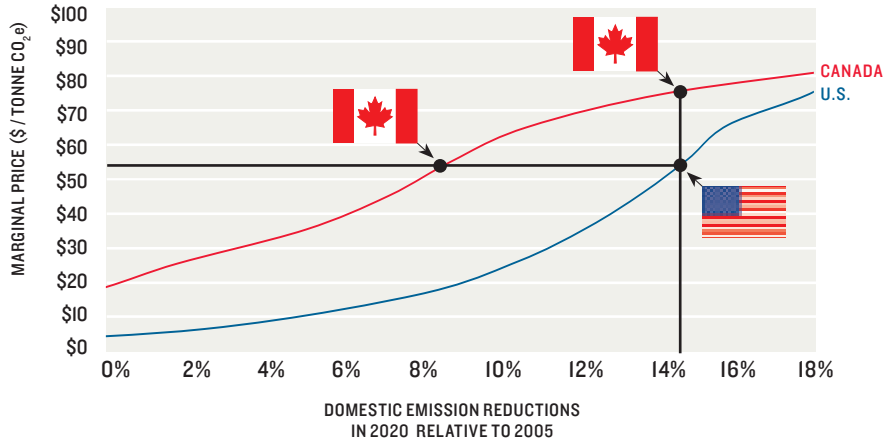
This figure shows the result if Canada harmonizes with the U.S. on targets. Under this scenario, the U.S. achieves its 2020 emissions reduction target of 17% below 2005 levels by implementing an economy-wide cap-and-trade system to achieve domestic emission reductions of 14%, with the remaining 3% of targeted reductions made up through international permit purchases. Under this cap, a carbon price of $54 / tonne CO_2e would emerge in a U.S. carbon market. By setting the same cap as the U.S. in 2020, Canada achieves the same reductions. However, a carbon price of $78 / tonne CO_2e would emerge in a Canadian carbon market.

FIGURE 14 b Canada harmonizes on carbon price with U.S. — Canada achieves fewer reductions



This figure shows the result if Canada was to harmonize with the U.S. on carbon price by setting the price of carbon in Canada equal to the price in the U.S. ($54 / tonne CO_2e). Under this scenario, Canada would achieve only 8% domestic reductions below 2005 levels by 2020 instead of the 14% achieved in the U.S. at the same price.

FIGURE 14 c Canada harmonizes on carbon targets vs. price with U.S.



This figure shows the results both for Canada harmonizing with the U.S. on targets, and for Canada harmonizing with the U.S. on carbon price.

Where Canada and the U.S. are positioned on the cost curves — i.e., the price of carbon and the corresponding level of emission reductions — is determined by the specific elements of policy design. The curves only include domestic abatement and do not account for elements of domestic cost-containment, which would reduce costs. Countries could use international permits or domestic offsets to achieve compliance with domestic targets at lower costs. Alternatively, they could limit the permit price using a safety valve. These forms of cost containment effectively avoid the steep parts of the cost curves associated with deep, high-cost reductions. The price of carbon resulting from the policy is therefore not only a function of the targets to be achieved but also the extent to which compliance mechanisms such as offsets or technology funds are allowed. We return to the trade-offs associated with these specific policy tools in Chapter 4.

SAFETY VALVE AND OFFSETS

// **SAFETY VALVE** is a cap-and-trade design mechanism to set a maximum permit price. By selling additional permits directly at this price, government can limit the magnitude of the market price of carbon.

// **OFFSETS** are emission reductions that are created outside any regulated system and sold to regulated emitters. Regulated emitters can use offsets, instead of permits, to comply with the carbon-pricing policy. Because emission reductions from changes in forestry, agriculture, or landfill gas practices are difficult to include under a cap-and-trade system directly, including these reductions as offsets can allow firms to take advantage of potentially lower-cost reductions in these areas, reducing the overall costs of the policy.

RISKS OF A CANADA-U.S. CARBON PRICE DIFFERENTIAL

How significant are the risks of different carbon prices in Canada and the U.S. relative to other drivers of economic impacts? **Table 8** illustrates GDP and trade impacts for different levels of carbon price alignment. The results show that a higher carbon price in Canada leads to decreased exports for Canada, with a larger price differential leading to a larger negative trade impact. They reinforce the idea that a higher carbon price for Canada creates competitive disadvantage. But overall macroeconomic impacts for Canada for both Canada Harmonizes and Canada Leads scenarios are very similar.

TABLE 8 ECONOMIC IMPACTS OF *CANADA LAGS, CANADA LEADS,* AND *CANADA HARMONIZES* SCENARIOS

SCENARIO[34]			CANADIAN GDP IMPACTS		INCREASE IN TRADE BALANCE FOR CANADA IN 2020 RELATIVE TO REFERENCE CASE ($ BILLIONS)	INCREASE IN CAPITAL FLOWS TO CANADA IN 2020 RELATIVE TO REFERENCE CASE
	CANADIAN CARBON PRICE IN 2020 ($/TONNE CO_2e)	U.S. CARBON PRICE IN 2020 ($/TONNE CO_2e)	AVERAGE ANNUAL GDP GROWTH TO 2020 (REFERENCE CASE IS 2.1%)	% CHANGE IN GDP IN 2020 RELATIVE TO REFERENCE CASE		
CANADA LAGS (17% REDUCTIONS IN U.S. ONLY)	$0	$52	2.0%	-0.2%	$6.0	0.1%
CANADA LEADS; NO POLICY IN U.S. (17% REDUCTIONS IN CANADA ONLY)	$74	$0	1.9%	-2.0%	-$5.3	-1.3%
CANADA HARMONIZES ON TARGETS (17% REDUCTIONS IN EACH COUNTRY)	$78	$54	1.9%	-2.3%	$0.5	-1.3%
CANADA HARMONIZES ON PRICE	$54	$54	1.9%	-1.6%	$2.0	-0.9%

In all cases, the modelling shows that while there is less economic growth with any climate policy compared to no policy, that growth is impacted only modestly. The economy does not shrink; it simply does not grow as much as it is projected to grow otherwise. **Figure 15** illustrates the forecast GDP under the four main scenarios.

34 All these scenarios represent variations on the case in which Canada and the U.S each implement a cap-and-trade system to achieve 2020 target of 17% below 2005 levels, with 20% of its compliance coming from international permits. We model U.S. policy as this simplified economy-wide cap-and-trade system so as to have a common point of comparison across the Canada Lags, Canada Leads, and Canada Harmonizes scenarios. Permits to large emitters are allocated for free as output-based allocations in order to reflect trends toward free permits in the U.S. The rest of the economy is covered through an upstream cap with permit auction and revenue recycling 50% to corporate and 50% to income tax. This split reflects a neutral distribution; revenue is roughly distributed back to households and firms in the proportion in which it was collected. In the Canada Leads and Canada Lags scenarios, only one country implements this policy by 2020, while the other has no policy at all. In the Canada Harmonizes on Price scenario, the Canadian carbon price is limited so as to match the price of carbon in the U.S.

FIGURE 15 FORECAST CANADIAN GDP IN 2020 FOR *CANADA LAGS*, *CANADA LEADS* AND *CANADA HARMONIZES* SCENARIOS

SCENARIO	GDP IN 2020
REFERENCE CASE	+ $1,746 BILLION
CANADA LAGS	+ $1,743 BILLION
CANADA LEADS	+ $1,712 BILLION
CANADA HARMONIZES ON TARGETS	+ $1,706 BILLION
CANADA HARMONIZES ON PRICE	+ $1,718 BILLION

Yet the results raise a question as to other factors at play. Are there other economic or policy drivers causing economic impacts beyond carbon price differentials between the two countries? Any effective climate policy leads to some costs and hence, to impacts on the economy. So, what are the key drivers of economic impacts for Canada — Canada's own emission reductions policy or differences between Canadian and American policies?

Table 9 sets out the key drivers for each of the four NRTEE policy scenarios: Canada Leads, Canada Lags, Canada Harmonizes on Targets, and Canada Harmonizes on Price. We identify three key drivers: U.S. climate policy, Canadian climate policy, and carbon price differential. For example, when only Canada implements policy, impacts under the scenario result from the Canadian policy driver and from the competitiveness policy driver because there is a carbon price in Canada but not in the U.S. Similarly, when only the U.S. implements policy, Canada would experience decreased demand for exports to the U.S., but would also enjoy a competitive advantage in that Canadian industry would not face added costs for their GHG emissions.

TABLE 9 KEY DRIVERS AND IMPACTS FOR SCENARIOS

SCENARIO	DRIVER			2020 CARBON PRICE ($ / TONNE CO_2e)		ANNUAL AVERAGE GDP GROWTH RATE TO 2020	
	U.S. POLICY	CANADIAN POLICY	CARBON PRICE DIFFERENCES	CANADA	U.S.	CANADA (REFERENCE CASE IS 2.1%)	U.S. (REFERENCE CASE IS 2.3%)
CANADA LAGS	YES	NO	CANADIAN ADVANTAGE	$0	$54	2.0%	2.2%
CANADA LEADS	NO	YES	U.S. ADVANTAGE	$74	$0	1.9%	2.3%
CANADA HARMONIZES ON TARGETS	YES	YES	U.S. ADVANTAGE	$78	$54	1.9%	2.3%
CANADA HARMONIZES ON PRICE	YES	YES	NEITHER	$54	$54	1.9%	2.3%

THREE CONCLUSIONS CAN BE DRAWN FROM THIS ANALYSIS:

// CANADA'S OWN POLICY is the largest driver of impacts. Effective Canadian climate policy that drives Canadian emission reductions imposes costs on the Canadian economy as it restructures — costs that are independent of U.S policies and their impacts.

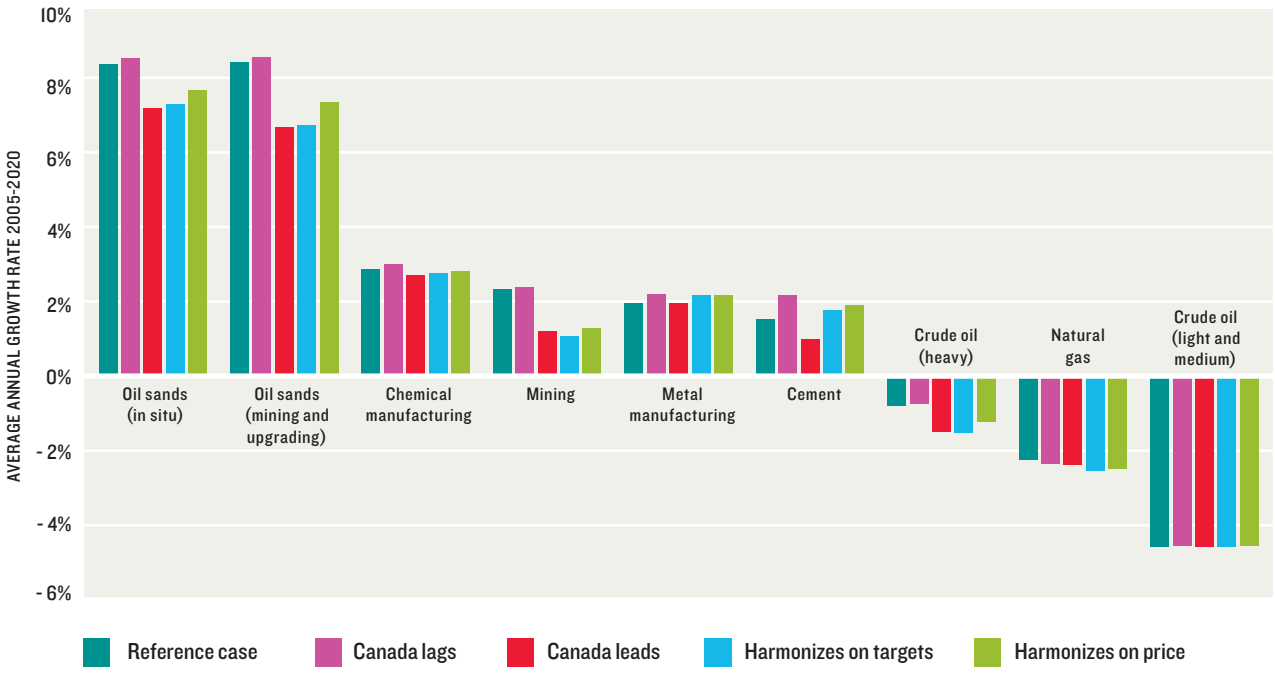
// U.S. POLICY IMPOSES COSTS on the Canadian economy, but these costs are secondary to those imposed by Canadian policy. Effective climate policy implemented in the U.S. causes similar restructuring of its economy over time with additional costs imposed. Any dampening of the U.S. economy subsequently imposes costs on Canada through decreased demand for Canadian goods in the U.S. and reduced exports.

// DIFFERENCES BETWEEN CANADIAN AND U.S. carbon prices can result in competitiveness impacts to Canada, both positive and negative. If policy is more stringent in Canada than in the U.S., American firms could have a competitive advantage over Canadian firms. A significant competitive disadvantage could drive Canadian industry to relocate

to jurisdictions with less stringent policy, resulting in negative overall economic impacts for Canada. Yet differences between Canadian and U.S. policy are less important than Canadian policy itself. As **Table 9** illustrates, even when carbon prices in Canada and the U.S. are matched in the Harmonized on Price scenario, removing any competitive advantage either country might enjoy as a result of less-stringent policy, costs to Canada still exist as evidenced in the lower GDP growth rate relative to the reference case.

As the NRTEE noted in its *Achieving 2050* reports,[35] competitiveness is largely a sectoral story. How then are Canada-U.S. climate policy impacts distributed among specific sectors in Canada? **Figure 16** illustrates the GDP impacts for emissions-intensive and trade-exposed sectors under our four main scenarios: Canada Leads, Canada Lags, Canada Harmonizes on Price, and Canada Harmonizes on Targets.

FIGURE 16 AVERAGE ANNUAL GROWTH RATES FROM 2005 TO 2020 FOR CANADIAN EMISSIONS-INTENSIVE AND TRADE-EXPOSED SECTORS UNDER MAIN SCENARIOS



35 NRTEE (2009), NRTEE (2009a).

TWO KEY FINDINGS EMERGE FROM THIS ANALYSIS:

FIRST, the results confirm that sectors that are emissions-intensive and trade-exposed are most affected by carbon price differentials between Canada and the U.S.[36] When Canada lags and the U.S. acts alone, these sectors grow more rapidly, enjoying a competitive advantage over their U.S. competitors. On the other hand, when Canada acts alone, these sectors are disadvantaged. When both the U.S. and Canada implement policy, this impact is significantly mitigated when the carbon prices are the same in the U.S. as shown in the harmonized scenario.

SECOND, the analysis reinforces that Canada has influence over only some of the economic impacts that would be imposed on the Canadian economy by climate policy. Aligning carbon prices with the U.S. will reduce, but not eliminate, negative economic impacts. Some sectors, such as oil sands producers, are affected more by overall stringency of Canadian and U.S. policy, not by the relative difference between policies in each country. However, Canadian policy choices can reduce economic impacts to some extent: if Canada wishes to achieve actual domestic emission reductions, some costs cannot be avoided.

Figure 17 qualitatively summarizes our assessment of economic and environmental risks for Canada of harmonizing with the U.S. If Canada were to harmonize with the U.S. on targets, it would still face competitiveness and distributional risks from higher prices in Canada relative to the U.S. On the other hand, if it were to harmonize on price, it would face risks of not achieving its 2020 targets and setting Canada up for the risk of more challenging and more expensive emission reductions in the long term. Harmonizing on carbon price would moderate but not eliminate market-access risks in the form of U.S. border adjustments, which could potentially be applied based on comparability of targets.

FIGURE 17 RISKS FOR CANADA UNDER THE *CANADA HARMONIZES* SCENARIOS

RISKS	ECONOMIC RISKS				ENVIRONMENTAL RISKS	
	COMPETITIVENESS	DISTRIBUTIONAL	MARKET ACCESS	LOW-CARBON TRANSITION	TARGET ACHIEVEMENT	CUMULATIVE EMISSIONS
CANADA HARMONIZES ON TARGETS	MODERATE	HIGH	VERY LOW	VERY LOW	VERY LOW	VERY LOW
CANADA HARMONIZES ON PRICE	VERY LOW	MODERATE	LOW	LOW	MODERATE	LOW

36 Bramley, M., Partington, P.J., & Sawyer D. (2009), and National Round Table on the Environment and the Economy (2009).

3.4 SUMMARY: LAG, LEAD OR HARMONIZE?

No scenario is risk free for Canada.

The figure below summarizes our combined analysis of risks for all four scenarios.[37] As illustrated in **Figure 18**, different risks, both environmental and economic, are present across these four scenarios and trade-offs will be required.

FIGURE 18 THE CANADA-U.S. CLIMATE POLICY RISK MATRIX: RISKS FOR CANADA UNDER *CANADA LAGS*, *CANADA LEADS*, AND *CANADA HARMONIZES* SCENARIOS

RISKS	ECONOMIC RISKS				ENVIRONMENTAL RISKS	
	COMPETITIVENESS	DISTRIBUTIONAL	MARKET ACCESS	LOW-CARBON TRANSITION	TARGET ACHIEVEMENT	CUMULATIVE EMISSIONS
CANADA LAGS	VERY LOW	VERY LOW	MODERATE	HIGH	HIGH	HIGH
CANADA LEADS	MODERATE	HIGH	VERY LOW	VERY LOW	VERY LOW	VERY LOW
CANADA HARMONIZES ON TARGETS	MODERATE	HIGH	VERY LOW	VERY LOW	VERY LOW	VERY LOW
CANADA HARMONIZES ON PRICE	VERY LOW	MODERATE	LOW	LOW	MODERATE	LOW

Overall our analysis suggests that *lagging* behind the U.S. in implementing climate policy offers the most risks for Canada. Lagging the U.S. leads to both economic risks — from U.S. border adjustments and low-carbon fuel standards — and environmental risks, as Canada achieves no emission reductions and fails to stimulate low-carbon technological innovation. Further, we have shown that much of the economic impact on the Canadian economy in our forecast is a function of the stringency of Canadian policy and degree of restructuring in the Canadian economy that will result. That is, the analysis suggests that

37 See Appendix 7.2 for a breakdown of our two-step approach to qualitatively assessing magnitude and likelihood of impacts.

seeking to harmonize perfectly with the U.S. will reduce some competitiveness impacts, but will not eliminate the economic impacts of Canada's eventual emission reductions. Indeed, delay risks making the ultimate achievement of emission-reductions more expensive; it delays the development and adoption of low-carbon technologies, encourages the continued investment in carbon-intensive technologies, and thus increases the overall and relative costs of achieving emission-reduction targets.

Implementing policy independent of the U.S., or *leading*, can ensure that Canada moves toward achieving its emissions reduction targets. Putting a carbon pricing policy in place now sends a signal to the economy to invest in low-carbon technologies. Beginning this transition earlier rather than later reduces the costs of achieving reductions both in the short and long terms. But implementing effective climate policy independent of the U.S. leads to economic competitiveness risks for some sectors.

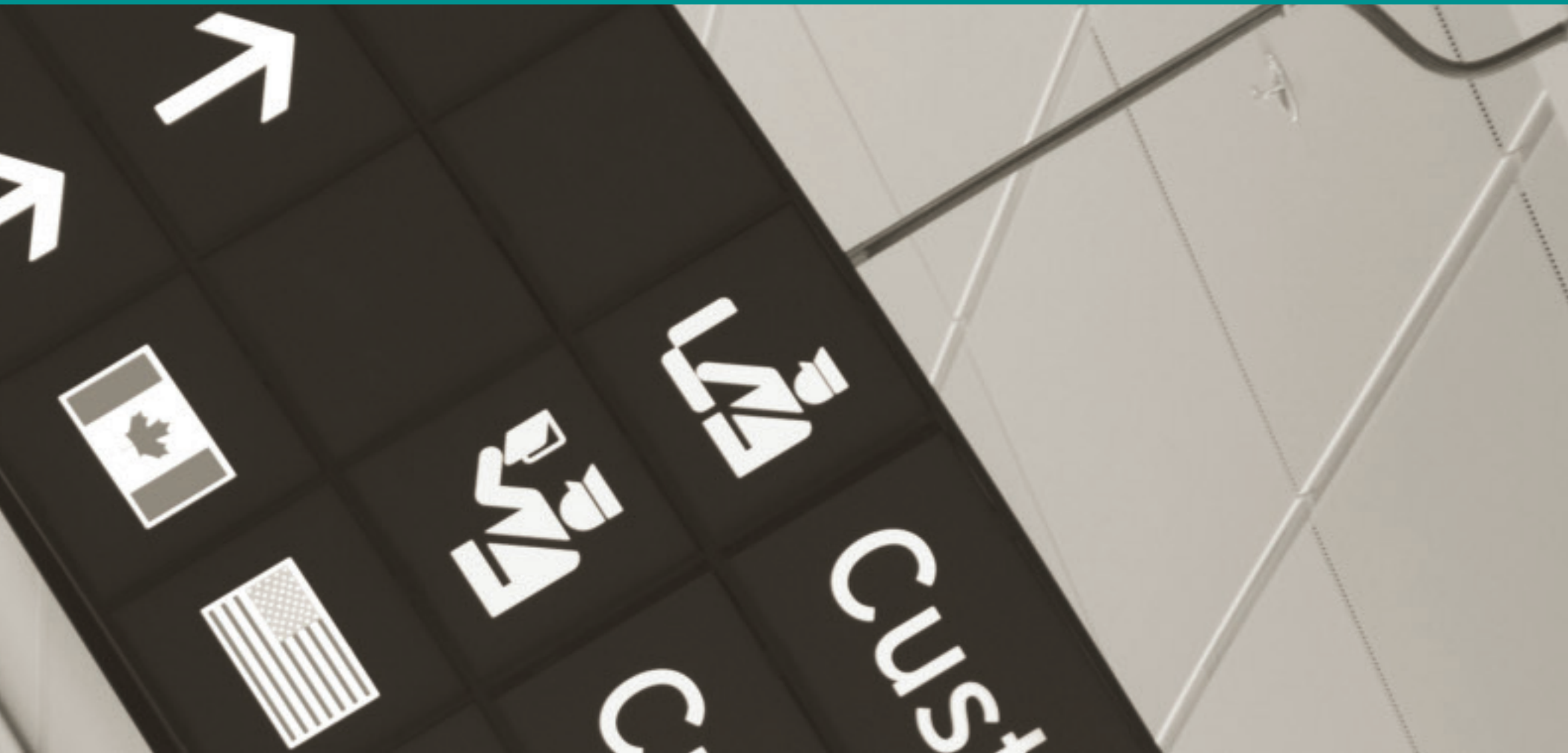
Harmonization also poses risks. Our analysis suggests that harmonizing with the U.S. on targets will result in potentially higher carbon prices in Canada than in the U.S. and consequently in competitiveness risks for some Canadian sectors. Harmonizing on price would reduce — though not eliminate — economic risks. But it would also reduce the emission reductions Canada would achieve. And harmonization as an overall policy strategy also poses risks of delay, as long as U.S. legislation is in flux. Any policy that is entirely contingent on U.S. action will limit our progress toward reducing emissions domestically.

Canadian policy design choices offer opportunities to manage the risks apparent from these scenarios. The NRTEE's approach has sought to achieve the most emission reductions at the least economic cost. We consider environmental and economic objectives jointly. Managing the inevitable environmental/economy trade-off leads us to consider where, when, and how Canada can harmonize climate policy with that of the United States to reduce competitiveness impacts, and where Canada can effectively lead the United States so it can begin to achieve its GHG emission reductions. The next chapter explores opportunities to do so.

ASSESSING OPPORTUNITIES

FOR CANADA-U.S. CLIMATE POLICY

// CHAPTER 04



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4.0 // ASSESSING OPPORTUNITIES FOR CANADA-U.S. CLIMATE POLICY

4.1 // LINKING WITH A U.S. CAP-AND-TRADE SYSTEM TO HARMONIZE PRICES

4.2 // ALIGNING CARBON PRICES THROUGH COST CONTAINMENT MEASURES

4.3 // PERMIT ALLOCATIONS AND REVENUE RECYCLING TO ADDRESS REGIONAL IMPACTS

4.4 // CONTINGENT CARBON PRICING TO LIMIT COMPETITIVENESS RISKS AND ACHIEVE EMISSION REDUCTIONS

4.5 // SUMMARY: OPPORTUNITIES FOR CANADA

4.0 ASSESSING OPPORTUNITIES FOR CANADA-U.S. CLIMATE POLICY

In the previous chapter, we assessed the risks for Canada under scenarios of lagging, leading, or harmonizing with the United States on climate policy.

We found that no approach for Canada is risk-free. Uncertainty in U.S. policy makes managing these risks even more challenging. Yet adaptive Canadian policy design represents an opportunity to manage these risks.

In this chapter, we assess policy tools that present possible risk management opportunities for Canada. Four tools emerge for Canada to address the key economic and environmental risks identified in the preceding chapter. In particular, these tools address competitiveness concerns through harmonizing carbon prices with the U.S., while responsibly moving forward on reducing emissions. These tools could be applied in the context of uncertain U.S. climate policy to create a feasible made-in-Canada climate policy approach:

1. // **LINKING EMISSIONS TRADING SYSTEMS**[38] involves trading carbon permits between Canada and the U.S under an integrated cap-and-trade system to create a North American carbon market. It would result in the convergence of carbon prices between Canada and the U.S. This tool would address competitiveness and market access risks, but increase the risk of delaying Canada's transition to a low-carbon economy.

2. // **ALIGNING CARBON PRICES** involves using Canadian policy levers to ensure the Canadian carbon price does not go above the U.S. price. Canadian policy levers include access to international permits as well as a safety valve to ensure the Canadian carbon price matches with the U.S. price. This tool would address competitiveness risks, but raises the risk of Canada not achieving its GHG targets.

3. // **PERMIT ALLOCATION AND REVENUE RECYCLING** involves either auctioning permits and recycling the revenue back into the economy or providing permits for free under a national cap-and-trade system. Permit allocation decisions can affect the distributional

38 See Sawyer, D. and Fischer, C. (2010) for a detailed review of the implications of linking Canada-U.S. cap-and-trade systems.

impacts of competitiveness and of achieving Canadian emission reductions, depending on how permits and revenue are distributed in the economy. This tool could address distributional risks.

4 // **CONTINGENT CARBON PRICING** involves setting an initial carbon price for Canada that is higher than any U.S. price in order to begin to make emission reductions while managing competitiveness concerns. It would position Canada's policy between harmonizing with the U.S. targets and harmonizing with the U.S. carbon price. The contingent price could be set at a maximum dollar amount relative to the U.S. price so it sends a clear price signal but is not so high that negative economic impacts are generated. It could be adjusted up or down when American carbon price intentions are known or appear in the marketplace. This tool would balance competitiveness and environmental risks.

WE EXPLORE THESE RISK MANAGEMENT TOOLS THROUGH THREE GROUPS OF MODELLING SCENARIOS :

// **LINKAGE SCENARIOS** that consider first, Canada and the U.S. achieving targets with separate, unlinked cap-and-trade systems, and second, Canada and the U.S. achieving targets with linked cap-and-trade systems;

// **CARBON PRICE ALIGNMENT SCENARIOS** that consider Canada achieving targets with no offsets, and Canada using a safety valve to limit the Canadian carbon price; and

// **PERMIT-ALLOCATION SCENARIOS** that consider free output-based allocations based on value-added, free out-based allocations based on emissions intensity, auction with recycling mostly to income tax, and auction with recycling mostly to corporate tax.

4.1 LINKING WITH A U.S. CAP-AND-TRADE SYSTEM TO HARMONIZE PRICES

Canadian policy continues to envision the possibility of a continental cap-and-trade system.

In May 2010, Prime Minister Stephen Harper stated, "in the integrated North American economy, it's difficult, if not impossible, to make progress on [a cap-and-trade system] without the co-operation of the United States."[39] This section examines issues of *linkage* and what it means to Canada's economic and environmental outcomes. In a linked trading system, emissions permits are traded between national carbon trading systems. If U.S. firms can use Canadian permits to comply with their carbon cap and vice versa, an integrated Canada-U.S. trading market is the result. Such an integrated, linked market would lead to a convergence of carbon prices for the two countries. Alternatively, in an *unlinked* approach, Canadian and U.S. markets are entirely independent with no trading and potentially different carbon prices.

Linking is thus one possible approach to harmonize carbon prices. Linking could benefit Canadian firms because U.S. permits will be available at lower cost than Canadian permits, thus lowering the price of carbon and the costs of meeting their GHG emissions obligations. **Table 10** illustrates this point. The table compares the carbon price and GDP impacts between a scenario where Canada's cap-and-trade system is independent of the U.S. — unlinked — and a scenario in which the systems are linked. The results show that Canada's linked carbon price falls between the Canadian and U.S. unlinked price at $60, but closer to the U.S. price. Linking could therefore decrease the costs of policy substantially for Canada but raises it slightly for the United States. This result is consistent with other analyses of linkage: overall economic efficiency of the system is increased, though individual linkage partners could experience gains or losses.[40]

39 Clark, C., & Milner, B. (2010).

40 Jaffe, A., & Stavins, R. (2007); Lazarowicz (2009).

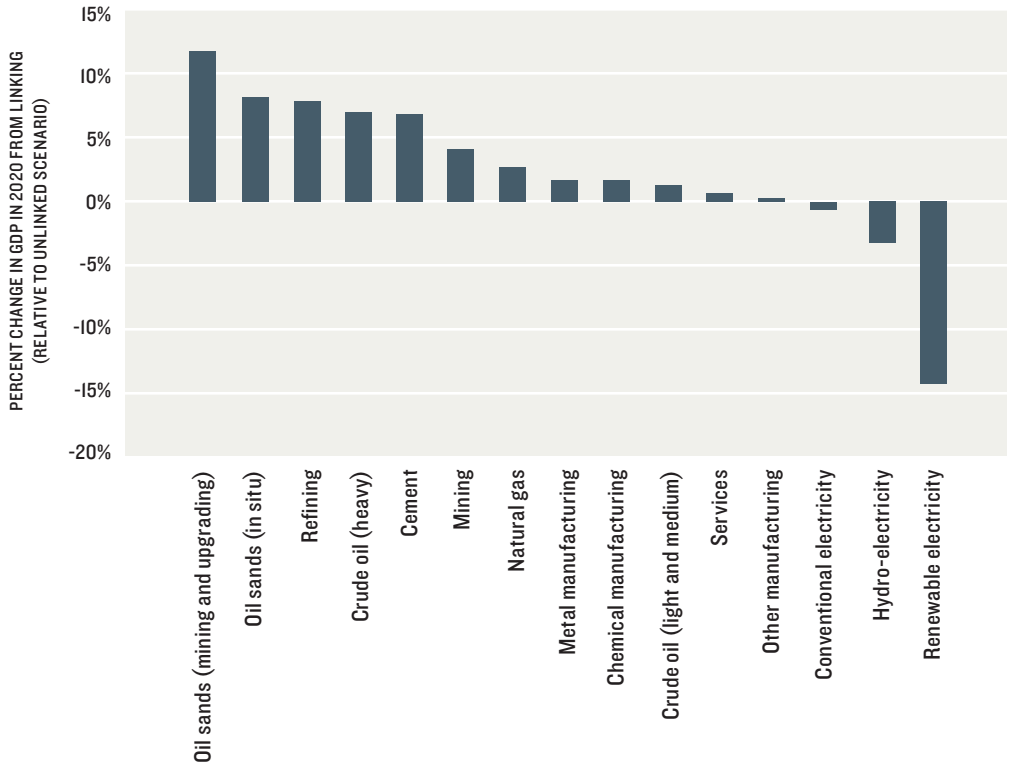
TABLE 10 FORECASTED ECONOMIC OUTCOMES OF LINKAGE WITH THE U.S. FOR CANADA

SCENARIO[41]		CARBON PRICE ($ / TONNE CO_2)		AVERAGE ANNUAL GDP GROWTH RATE		PURCHASE OF U.S. PERMITS BY CANADA IN 2020 (IN CAN $ MILLIONS)
		CANADA	U.S.	CANADA (REFERENCE CASE IS 2.1%)	U.S. (REFERENCE CASE IS 2.3%)	
17% BELOW 2005 TARGETS IN BOTH CANADA AND U.S.	UNLINKED	$78	$54	1.9%	2.3%	–
	LINKED	$60		1.9%	2.3%	$2,097

The implications for Canadian industrial sectors of a linked Canada-U.S. cap-and-trade system mirror the overall positive national outcomes presented above. Some sectors, however, experience greater benefits from the lower, harmonized carbon price that would result from a linked system. As illustrated in **Figure 19**, sectors that might benefit most from linking – and a subsequently lower carbon price – include the oil sands and refining sectors, as well as those that benefit from a level playing field with carbon competitors in the U.S., such as cement and iron and steel.

41 These scenarios show key outcomes with and without trade of emissions permits enabled between the Canadian and U.S. systems (linked and unlinked). In the first scenario set, Canada and the U.S. each implement a cap-and-trade system to achieve their 2020 target of 17% below 2005 levels, with 20% of its compliance through international permits. We model U.S. policy as this simplified economy-wide cap-and-trade system so as to have a common point of comparison across the Canada Lags, Canada Leads, and Canada Harmonizes scenarios. Permits to large emitters are allocated for free as output-based allocations in order to reflect trends toward free permits in the U.S. The rest of the economy is covered through an upstream cap with permit auction and revenue recycling 50% to corporate and 50% to income tax. This split reflects a neutral distribution; revenue is roughly distributed back to households and firms in the proportion in which it was collected.

FIGURE 19 GDP GAINS AND LOSSES FOR CANADIAN SECTORS FROM LINKING WITH THE U.S. (PERCENT DIFFERENCE IN GDP BETWEEN LINKED AND UNLINKED SCENARIOS)

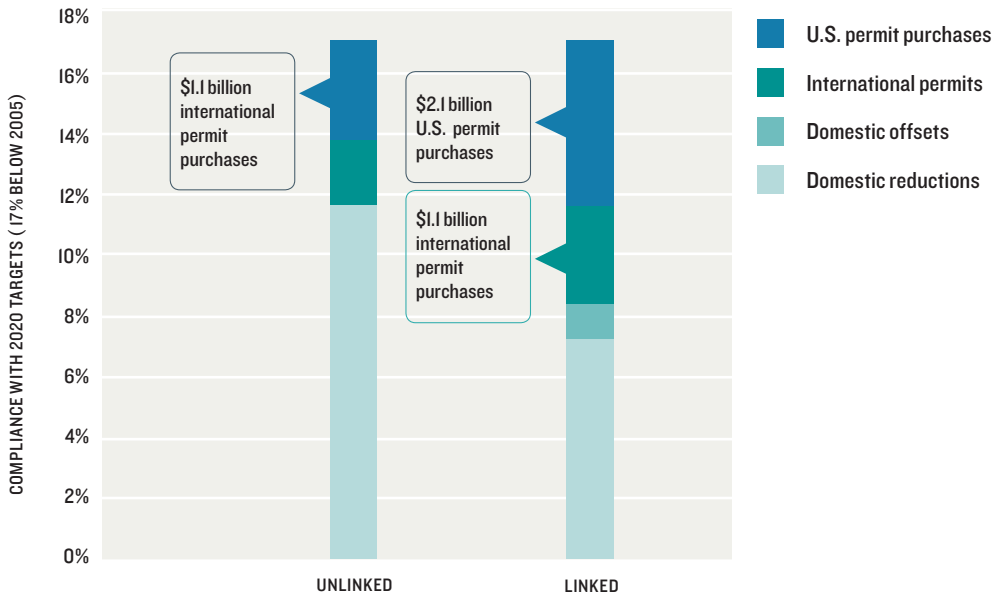


Linkage comes with trade-offs — environmental and economic. Linked Canadian and U.S. cap-and-trade systems would result in lower costs for Canadian firms relative to a Canada-only system, but linkage also means fewer domestic emission reductions would be realized. The lower price requires the purchase of U.S. permits by Canadian firms. Such permit purchases are effectively financial transfers from Canadian firms to American firms. NRTEE modelling shows this would total about $2 billion in 2020 in the scenario set out in **Table 10**. Money invested in the U.S. through permit purchases is money not invested in Canadian low-carbon technology and practices. Consequently, these transfers could impose opportunity costs. **Figure 20** shows the difference in U.S. permit purchases required between linked and unlinked scenarios under NRTEE modelling. In each scenario, 20% of total compliance is achieved through international permit purchases, amounting to around $1 billion in 2020, depending on the market price of international permits.[42]

42 NRTEE modelling assumed a flat price of $25/tonne CO_2e for international permits if the U.S. does not implement policy (and thus does not compete for low-cost international reductions) and $50/tonne CO_2e if the U.S. does implement policy.

Compliance through domestic offsets, as shown in the figure, includes only reductions from landfill gas in Canada, which is modelled explicitly in the GEEM model. Other potential sources of domestic offsets, such as forestry and agriculture, are not explored in our analysis.

FIGURE 20 CANADIAN COMPLIANCE UNDER UNLINKED AND LINKED SCENARIOS



As noted, a lower carbon price would reduce costs to the economy in the short term, but also reduce incentives for innovation and deployment of the new, low-carbon technologies necessary over the long-term. Of particular risk for Canada is that prices contained in this scenario are below thresholds at which carbon capture and storage (CCS) becomes economically viable based on current costs of the technology. Recent studies suggest that CCS in Canada may not experience significant market penetration below a threshold carbon price of approximately $70–80/tonne.[43] In the long term, CCS could be a critical technology for Canada's oil and gas industries to remain competitive in a global low-carbon economy. Previous NRTEE studies have demonstrated the important contribution CCS could make to achieve the scale of domestic emission reductions necessary to achieve Canadian targets.[44]

43 Integrated CO_2 Network Group of Companies (2009).

44 NRTEE (2009).

A short-term barrier to linkage may reside in American public acceptability. A linked carbon trading system requires Canada to accept U.S. permits as valid, and vice versa.[45] Two issues emerge. First, a linked Canadian-U.S. system would likely increase the carbon price in the U.S. While the increase would be small given the relatively smaller size of the Canadian market, this outcome might still be undesirable in the U.S. as it would experience lower GDP growth under a linked scenario.

Second, current U.S. legislation[46] indicates that linking would constrain Canadian policy design choices. Both the Waxman-Markey and Kerry-Boxer bills admit the possibility that permits issued under a Canadian cap-and-trade regime could be treated as comparable to those issued under a U.S. system. As defined in both bills, the primary standard for using international emissions permits as compliance within the U.S. is imposing "a mandatory absolute tonnage limit on greenhouse gas emissions."[47] Both a technology fund and intensity-based targets, as proposed under the original Canadian *Turning the Corner* plan,[48] would preclude linkage with the U.S. under these terms in both the House and Senate proposals. These mechanisms can constrain costs, but in doing so, create uncertainty in the absolute quantity of emissions to be reduced. Based on text in the proposed legislation, it seems clear that emissions permits will not be recognized from another country unless two conditions are met : a fixed number of allowances are available for every compliance period, and the implied level of emission reductions is at least as stringent as that imposed in the U.S.[49]

Overall, while linkage could provide a means of addressing Canadian competitiveness issues by harmonizing the carbon price between Canada and the U.S., it remains problematic as a short-term solution, both because of timing and because it requires U.S. participation. Establishing a national cap-and-trade system within Canada in the interim would position Canada to link ultimately with the United States. It would also allow for piloting the system to "de-bug" it, and reduce the cost of fragmentation associated with different federal and provincial climate policy approaches, as the NRTEE noted in its *Achieving 2050* report. The Western Climate Initiative cap-and-trade model being developed now could offer a solid foundation upon which to build.

45 For full "two-way" linking, both trading partners would accept the emissions permits from each other's system. Under "one-way" linking, Canada could unilaterally accept U.S. permits as valid for compliance with a Canadian cap.

46 H.R. 2454 (2009) and S.1733 (2009).

47 H.R. 2454 (2009), section 728.

48 The *Turning the Corner* plan included a "Climate Change Technology Fund" that is both a safety valve compliance mechanism that would allow firms to meet a portion of their compliance obligations by contributing to a fund, as well as a means of a revenue recycling in that it would return revenue to investments in emissions-reducing technologies. The plan included intensity targets in that it introduced emissions-intensity performance standards that would determine the right to emit for covered entities; with no change in output, each facility would effectively be given the right to emit 18% less than they did in 2006 and 2% less for each year thereafter. An increase in output would increase the level of allowable emissions for the facilities. See Environment Canada (2007).

49 Also see Bramley, M., Partington, P.J., and Sawyer, D. (2009) for discussion of implications of cap-and-trade design for linkage.

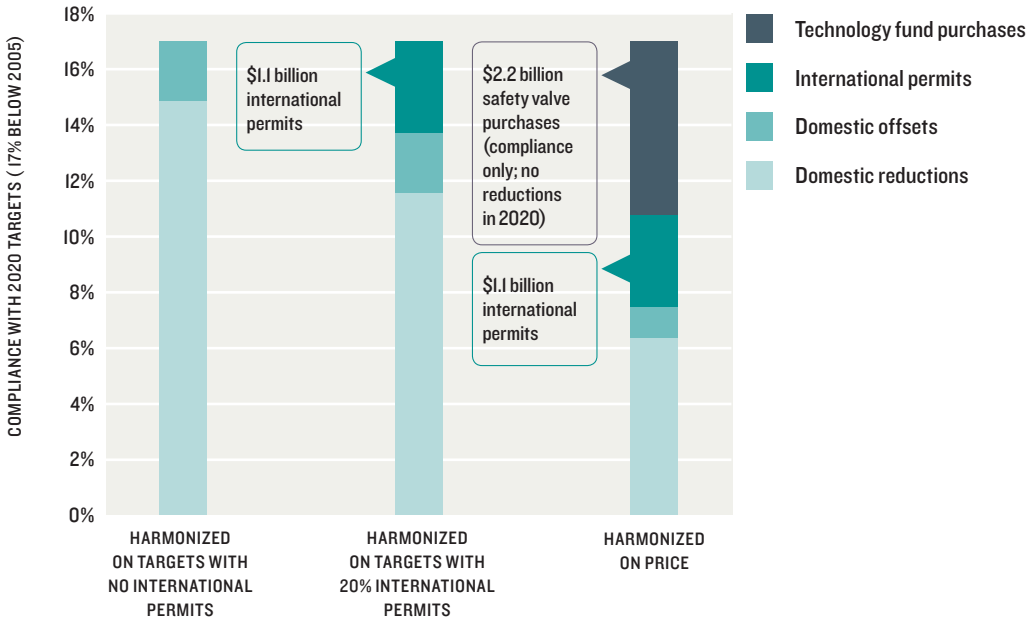
4.2 ALIGNING CARBON PRICES THROUGH COST CONTAINMENT MEASURES

Cost containment mechanisms can help align carbon prices between Canada and the United States, addressing competitiveness issues.

Use of these mechanisms could effectively result in a harmonized carbon price between the two countries and has some of the benefits of linkage without implementing a fully linked North American carbon-trading market. Mechanisms under Canadian control include allowing for international and domestic offsets as well as a safety valve to contain the price of carbon.

An alignment approach to match Canadian and American carbon prices does, however, pose possible trade-offs for achieving emission-reduction targets. Alignment with a lower U.S. carbon price results in less Canadian abatement, which then leaves a compliance gap that must be filled if environmental goals are to be maintained. **Figure 21** highlights this trade-off. It shows how the Canadian economy is expected to meet its 2020 emissions cap under three different policy scenarios. With no international permits, compliance must be achieved through domestic reductions alone, whether emissions abatement or domestic offsets. If some purchases of international permits are allowed, less domestic abatement occurs. And finally, if Canada harmonizes with a U.S. carbon price using a safety valve, even less domestic abatement takes place, with the gap made up through purchases of additional permits from the government via the safety valve mechanism.

FIGURE 21 CANADIAN COMPLIANCE UNDER DIFFERENT HARMONIZATION SCENARIOS



As noted, we consider three main design options for price alignment leading to cost containment: a safety valve with a technology fund, access to international permits, and domestic forestry and agriculture offsets. Each is explained below:

TECHNOLOGY FUND

Canada could align carbon prices with the U.S. through a technology fund. Under such a mechanism, the government would sell additional permits to firms at a fixed price. Because these additional permits would be available at the level set by government, permits would not be valued higher than this threshold on the open market. This mechanism, known as a safety valve, limits the market price of carbon and sets a price ceiling. The safety valve becomes a *technology fund* when the government revenue from sales of additional permits is reinvested in low-carbon technology, providing additional incentives for development of low-carbon technologies beyond a carbon price.

Similar to the other mechanisms discussed in this section, the trade-off here is that containing costs can threaten the achievement of targets since the purchase of permits using a safety valve does not necessarily result in an immediate, realized emission reduction. A technology fund brings other challenges. It could prove to be a barrier for linkage with the U.S. given that it does not ensure that the capped level of reductions is actually achieved. The more firms access the safety valve to comply with their cap, the less domestic emissions are reduced. It would effectively "bust the cap." As a result, the U.S. might consider this Canadian system non-comparable and justification for border adjustments and for not linking cap-and-trade systems. However, the technology fund could to be structured to meet the criteria in U.S. proposals for ensuring an absolute level of reductions. For example, guarantees could be established that stipulate a fixed number of additional permits issued every year. Alternatively, similar to the Kerry-Lieberman bill, for every permit granted through the technology fund for compliance in the present, government could reduce the total number of allocations to be available in future compliance periods. This approach would ensure that over time, the total number of permits allocated would be limited.[50]

In the long term, revenue from a technology fund could increase the development and deployment of low-carbon technologies, no matter what policy choices the U.S. makes. The risk for Canada is that the limited carbon price under the safety valve could dampen expectations for higher Canadian carbon prices over the long term — and higher prices are needed to develop CCS and other technologies. **Table 11** illustrates estimated values of technology fund deposits for the Alberta technology fund (operational) and the original proposed federal technology fund (on hold) for the *Turning the Corner* plan. It is unlikely that compliance payments into a Canadian technology fund would be sufficiently large on their own to fully finance expensive CCS technology development and deployment. Nevertheless, it could begin to establish a useful source of investment revenue for government and industry for necessary low-carbon technology development and deployment. These investment dollars could provide critical leverage to help induce additional private investment. Further, testing and demonstration of CCS can lead to learning and improvements in technology and decreased costs for broader deployment.[51]

50 This approach also parallels the U.S. stability reserve in the American Clean Energy and Security Act. For every additional compliance permit issued by the government under the safety valve, future (post-2020) caps could be tightened. Effectively, the safety valve would provide a mechanism for borrowing from future compliance periods. A significant challenge for this option is the need to develop institutional capacity to ensure this borrowing is credible: would future governments adhere to the tighter targets in the long term? More analysis of this option is required. Yet given that the technology fund would provide support for technologies to enable longer-term emission reductions, requiring more stringent reductions in the long term may be feasible. Further, this approach could even potentially allow for eventual linkage with the U.S. because it would ensure absolute reductions, at least over the longer term.

51 Natural Resources Canada (2008).

TABLE II EXPECTED REVENUE FROM CANADIAN TECHNOLOGY FUNDS

POLICY	ESTIMATED VALUE
ALBERTA PROVINCIAL CLIMATE CHANGE AND EMISSIONS MANAGEMENT FUND	APPROXIMATELY $400 MILLION / YEAR IN 2020
TURNING THE CORNER PROPOSED CLIMATE CHANGE TECHNOLOGY FUND	AVERAGE OF $700 MILLION / YEAR BETWEEN 2010 AND 2017

The Alberta Climate Change and Emissions Management Fund provides some useful learning. In a recent report by the Conference Board of Canada[52] on the economic and employment impacts of climate-related technology investments in Canada, the Alberta system is singled out as a model that "appears to be working, based on the revenues generated to date and the fact that emitters are making use of all compliance options. They are reducing emissions, purchasing offsets, and trading in credits, as well as contributing to the technology fund." The report goes on to note that "the flexibility inherent in this system allows emitters to select the mix of options that best suits their circumstances." While the report does qualify that it is still too early in the investment cycle to quantify the emissions impact of the Fund, it is expected to generate and implement emissions-reducing technologies that will "contribute to reaching targets and provide sales opportunities on international markets." In June 2010, for example, Alberta's fund handed out $5.7 million for six energy efficiency projects.[53]

52 Conference Board of Canada (2010).

53 *Edmonton Journal* (2010, June 23).

ACCESS TO INTERNATIONAL PERMITS

Allowing Canadian firms to comply with some of their emission-reduction obligations (the "cap") through the purchase of international permits would allow them to avoid higher-cost emission reductions domestically. Increased access to international permits[54] would also lower the Canadian carbon price, pulling it closer to the U.S. price. This mechanism is important to consider as the U.S. proposals from the House and Senate all include extensive opportunities for compliance through international permits.[55] Canadian firms would be at a competitive disadvantage if similar measures were not reflected in Canada's climate policy. However, international permits could pose potential problems due to concern regarding challenges in verifying the credibility of international permits, unanticipated social and environmental implications, and flows of investment out of Canada.

Allowing real, verifiable, and measurable international permits would not affect the environmental effectiveness of the policy as emission reductions have the same effect in reducing climate change independent of their geographic location. However, this point is predicated on the assumption that the international reductions achieved are verifiable and additional. That is, sufficient quality control would be required to ensure that every reduction would not have occurred in the absence of the purchase of the permit. It also would be necessary to ensure that permit projects are environmentally and socially sustainable to ensure the integrity of the policy.[56]

Aligning prices through international permits poses some of the same economic risks that linkage does in that it implies comparable financial transfers out of Canada. NRTEE modelling suggests that this could amount to around $3 billion in 2020.[57] Flows of investment

54 International permits are emission reductions in other countries, and are bought and sold internationally. They could be permits from a other trading system such as the European ETS, but are more likely to be lower-cost reductions from the developing world from sources such as avoided deforestation. They could be obtained through existing mechanisms such as the Kyoto Protocol's Clean Development Mechanism (CDM) or the international institution that is established as the successor to CDM. Finally, even permits from a U.S. trading system could be accepted. Accepting U.S. permits would be a *one-way linkage*; U.S. permits would be accepted in Canada (if non-U.S. firms are allowed to participate in a U.S. carbon market) without Canadian permits necessarily being accepted in the U.S.

55 While we did not model a scenario with unlimited international permits in Canada and the U.S., such an approach could potentially harmonize Canadian and U.S. carbon prices through an effect known as *indirect linkage*. See Jaffe, J., & Stavins, R. (2007). If both Canada and the U.S. draw on the same pool of international permits, the carbon price in both countries will be drawn in the direction of the international market price. Both countries will avoid reductions that are more expensive than international permits. This indirect linkage can result some in convergence of carbon prices even without direct trading between the two countries.

56 Environmental and community groups have criticized the World Bank-managed Prototype Carbon Fund for funding large-scale development projects such as a eucalyptus plantation in Brazil, a hydroelectric dam in Guatemala, and a landfill in South Africa. These groups have argued that such projects may cause social and environmental harm. Ensuring the quality, equity, and sustainability of international permits can thus be a challenge and may pose some risks for the environmental effectiveness of the policy as a whole.

57 The cost of aligning prices with the U.S. through international permit purchases depends on the stringency of U.S. policy and on the cost of international permits. The $3 billion estimate assumes Canadian and U.S. carbon prices of $54/ tonne, with sufficient international permits (purchased at $50 / tonne) to make up the remainder of Canada's target. Keeping Canada's carbon price even lower would require more international permit purchases.

outside Canada could also have implications for long-term low-carbon competitiveness in Canada. Money spent on international permit purchases to reduce short-term costs of GHG obligations is money not spent on the long-term low-carbon technology innovation, development and deployment necessary to succeed in a global low-carbon economy. Further, it is important to note that availability of low-cost international reductions from developing countries[58] could be limited or delayed given lack of institutional capacity and competition from other countries with domestic cap-and-trade systems. In this case, the price of international emission reductions would be higher and less desirable. U.S. policy proposals like Waxman-Markey and Kerry-Lieberman rely extensively on international offsets, and analyses of these policies by the EPA largely assume international supply will be sufficient to meet this demand.[59] Yet the EPA analysis also recognizes uncertainty in the supply of these offsets due to limited institutional structure in developing countries to ensure that offsets are credible and meet quality standards.

The NRTEE's analysis follows similar thinking presented in the EPA analysis. Two elements of our analysis explicitly explored the issue of international permit availability. First, our assumption in the price of international offsets was dependent on U.S. policy in each scenario. This assumption explicitly recognized that there would be competing demand for international offsets, and that the U.S. would likely be a major buyer of permits if it implemented policy.[60] Second, like the EPA, we also explored scenarios in which no international offsets were allowed. In these scenarios, the price of carbon and costs of Canadian policy were correspondingly higher.

DOMESTIC OFFSETS

Access to domestic offsets is another mechanism for containing costs for Canadian firms. The extent to which offsets can be used to lower the Canadian carbon price (and thus to align with the U.S.) depends on the availability of real, verifiable, and measurable emission reductions from offsets in Canada. The NRTEE modelling considers only landfill gas. However, domestic forestry and agricultural offsets could contribute toward emission

58 Studies have estimated that large shares of low-cost offsets would likely come from reductions in deforestation in developing nations, which could require institutions to ensure reductions are verifiable and permanent and do not have other adverse social or economic impacts. See Commission on Climate and Tropical Forests (2009) and McKinsey and Company (2009).

59 The EPA's core scenario in its analysis of Kerry-Lieberman assumes U.S. firms will purchase between 600 to 1000 Mt of international offsets per year. See U.S. Environmental Protection Agency, Office of Atmospheric Programs (2010).

60 We assumed a fixed price for international reductions of $25 / tCO2e if the U.S. implements policy and a fixed price of $50 / tCO2e if the U.S. does not. The analysis therefore does not incorporate a detailed supply curve for international reductions. However, given the uncertainty the price and availability of international reductions, these conservative benchmarks provide useful representation of possible international reductions.

reductions in Canada. Domestic offsets from these and other industries could also reduce the required carbon price in Canada; however, a full analysis of these additional non-energy offsets is outside the scope of this analysis. Alternatively, as suggested in *Achieving 2050*, complementary regulations could be applied where possible to ensure emission reductions from non-energy emission sources not easily included in a cap-and-trade system.

U.S. analyses[61] suggest that extensive low-cost reductions may be available from U.S. forestry offsets. Canada may need to explore its own potentially large opportunities for land-use offsets. Little research has been conducted to date on changes in Canadian forestry practices to deliver credible, additional emission reductions and the costs at which they might be achieved, although U.S. studies give some sense of potential.[62]

4.3 PERMIT ALLOCATIONS AND REVENUE RECYCLING TO ADDRESS REGIONAL IMPACTS

The distribution of regional impacts across Canada is a key issue dominating the Canadian climate policy debate, but solutions exist.

As we have seen, these impacts are both the result of carbon price differences between Canada and the U.S., and a direct result of Canadian policy choices, independent of the U.S. In a national cap-and-trade system, steps can be taken to moderate or more evenly distribute regional or sectoral effects. In particular, how carbon pollution permits are allocated (free or otherwise), or how revenue from auctioned permits in a cap-and-trade system is recycled back to carbon emitters, drives regional and sectoral impacts. These policy design choices therefore provide an opportunity for Canada to minimize regional impacts and smooth the transition to a lower-emission economy.[63]

61 Congressional Budget Office (August, 2009), and U.S. Environmental Protection Agency Office of Atmospheric Programs (2009) and (2010).

62 This area seems to be a research gap in Canada. However, for analysis on Canada's forests and forests industry and GHG emission reductions, see U.S. Environmental Protection Agency, Office of Atmospheric Programs (2005); U.S. Environmental Protection Agency (2010); Boyland, M. (2006); McKenney, D. W., Yemshanov, D., Fox, G., & Ramlal, E. (2004); Yemshanov, D., McKenney, D. W., Hatton, T., & Fox, G. (2005); Graham, P. (2003); Natural Resources Canada (2009).

63 While a detailed analysis of the very complex issue of permit allocations is outside the scope of this paper, we determined that illustrating how adverse regional and sector-level impacts can be addressed through permit allocation and revenue recycling design choices was an important element to include.

AUCTIONS AND OUTPUT-BASED ALLOCATIONS

// **AUCTIONS** are one way to distribute permits in a cap-and-trade system; they require firms to bid on all permits required to meet the cap.

// **OUTPUT-BASED ALLOCATIONS** refers to permits allocated for free, for which the firm allocation is updated based on a current or lagged metric of production such as tonnes of output or value of production. The per-unit allocation is a benchmark based on a sector-wide metric such as an average emissions intensity, a percentage of historical average emissions intensity, or average value added.

Decisions about allocating emissions permits or recycling revenue from an auction of permits are fundamentally about distributing the value embedded in emissions permits. Because permits can be traded on a carbon market, they have value, and this value is effectively assigned to firms when government allocates permits. Similarly, if permits are auctioned, government accrues the value of the permits as auction revenue which it then can distribute to impacted firms, sectors, or households through revenue recycling mechanisms. In either case, this value is substantial. Under a scenario where Canada achieves its target of 17% below 2005 levels in 2020,[64] the value of the permits to be allocated is in the order of $35 billion in 2020.

To address regional impacts[65] of Canada-U.S. climate policy directions, the NRTEE explored a range of approaches, using both output-based allocations and recycling of auction revenue:

1. // **PERMITS ARE ALLOCATED** to firms based on the value of production, where sectors' shares of national value-added (GDP) are used to apportion the cap. In theory, this method is similar to a broad-based tax reduction.[66] In practice, it can result in allocation values well in excess of compliance costs for some sectors, which may not pass WTO scrutiny.

2. // **PERMITS ARE ALLOCATED** to firms based on their historical emissions intensity.

3. // **PERMITS ARE AUCTIONED** and a significant share of revenue is recycled to reduce corporate taxes.

64 With no cross-border trade with the U.S., and international permits of about 21 Mt.

65 All allocation and recycling scenarios seek to attain a fixed target or cap of 17% below 2005 in both Canada and the US, with no trading between countries. As we have noted, aligning on targets implies misaligning on price and so results in some competitive disadvantage for Canadian firms.

66 Fisher, C., and Fox, A. (2007).

For permit allocations, we focus on output-based allocations because this approach can significantly help the most vulnerable sectors (i.e., those that are emissions-intensive and trade-exposed) to transition to a lower emissions path.[67] They were also considered as part of the U.S. policy proposals in Waxman-Markey and Kerry-Lieberman. For revenue recycling, we focus on reducing tax rates (both corporate and income) in order to improve the overall efficiency of the climate policy. **Table 12** illustrates the national and regional growth rates under each of these approaches.

TABLE 12 AVERAGE ANNUAL GDP GROWTH TO 2020 OF PROVINCES UNDER ALTERNATIVE REVENUE RECYCLING / PERMIT ALLOCATION APPROACHES

SCENARIO		BC	AB	SK	MB	ON	QC	AT	CAN
OUTPUT-BASED ALLOCATION	BASED ON VALUE-ADDED BENCHMARK	2.1%	1.7%	2.0%	2.0%	2.2%	1.7%	1.5%	1.9%
	BASED ON EMISSIONS INTENSITY BENCHMARK	2.1%	2.0%	2.3%	1.9%	2.1%	1.7%	1.6%	1.9%
AUCTION WITH RECYCLING	25% TO CORPORATE TAX, 75% TO INCOME TAX	2.1%	1.8%	2.1%	2.1%	2.2%	1.8%	1.5%	1.9%
	50% TO CORPORATE TAX, 50% TO INCOME TAX	2.1%	1.8%	2.1%	2.1%	2.2%	1.8%	1.5%	1.9%
	75% TO CORPORATE TAX, 25% TO INCOME TAX	2.1%	1.8%	2.2%	2.1%	2.2%	1.8%	1.5%	2.0%
REFERENCE CASE		2.3%	2.1%	2.3%	2.1%	2.3%	1.8%	1.7%	2.1%

The approaches highlight how different allocation and revenue recycling strategies can alter distributional impacts. This effect is important given the differences that exist between the provinces in terms of their industries and emissions intensities. Different allocation or recycling strategies affect the carbon price only slightly.[68]

The two output-based allocation scenarios in **Table 12** illustrate how regional outcomes can be affected by allocation choices. Under the value-added approach, economic growth for Alberta, a region with an economy dependent on emissions-intensive sectors such as

67 Fisher, C., and Fox, A. (2009). Dissou, Y. (2006) suggests that OBAs in Canada result in benefits particularly to energy-intensive industries.

68 In most cases, the carbon price is not strongly affected by revenue recycling decisions, though output-based allocations can increase the required carbon price because they incent production. Different allocation strategies in Canada relative to the U.S. could affect Canadian competitiveness in a different way since free allocations are effectively a subsidy to certain sectors. Subsidies in one country but not the other could also affect competitiveness, though on a different order than differential carbon prices, given that even if permits are not allocated for free, auction revenue will still be recycled back to the economy in some way.

the oil sands, sees more significant impacts than less emissions-intensive regions such as Ontario. On the other hand, the impacts on emissions-intensive Alberta and Saskatchewan are significantly reduced if firms are allocated permits based on their emissions intensity. In this case, emissions-intensive firms can achieve compliance with less abatement or fewer purchases of emissions permits on the carbon market. Manitoba is an alternative case in point, where low emissions intensity due to a large hydro power resource translates into a higher overall cost when emissions are allocated on intensity. Similarly, firms in regions like Ontario, which are less emissions-intensive, receive fewer permits under the emissions-intensity allocation approach, and so have to abate more or purchase more permits to comply with their cap.

The revenue recycling scenarios suggest that recycling to corporate tax reductions can reduce the adverse distributional impacts on regions somewhat. The cost of new capital is reduced through lower taxation, which then lowers the cost of deploying new capital to abate emissions — or to invest in oil extraction or other capital-intensive activities. While recycling to income tax does help the other regions, the improvements in GDP are less dramatic. In general, corporate taxation is thought to impose more of a drag on the economy than income taxation, so lowering corporate taxes should result in a more positive effect on national GDP, although the distributional effects across Canadian households of different income and wealth levels will be quite different across the policies.[69] The downside of recycling to corporate taxes is increasing regressive effects on low-income households, which would also need to be addressed. With more recycling of revenue to labour or personal income, the labour-intensive regions like Ontario are left slightly better off, but with the trade-off of slightly higher impacts in Alberta and Saskatchewan. This finding supports renewed analysis on how the impacts of climate policy on the emission intensive provinces of Alberta and Saskatchewan are perceived. Appropriate revenue recycling that recognizes regional characteristics can reduce the regional inequities of climate policy.

69 See NRTEE (2009a); Baylor, M., & Beausejour, L.,(2004); Simonova, E., & Lefebvre, R. (2009).

4.4 CONTINGENT CARBON PRICING TO LIMIT COMPETITIVENESS RISKS AND ACHIEVE EMISSION REDUCTIONS

Contingent carbon pricing would limit both environmental and economic risks.

Making the Canadian carbon price contingent on the U.S. price could allow Canada to sit somewhere between harmonizing on price and targets, managing the risks of potentially high carbon prices and achieving emission reductions. Specifically, Canadian cost-containment design mechanisms could be used to allow a moderate, but limited difference between the Canadian and U.S. carbon price. Under this approach, the Canadian carbon price would be *contingent* on the U.S. carbon price, without matching it identically. By allowing a moderate price differential, Canada could implement policy immediately even if the U.S. continues to lag. Once the U.S. implements policy, the maximum Canadian carbon price would then float to a specified amount above the U.S. market price, limiting competitiveness impacts. If Canadian costs of abatement are less than expected, the safety valve might not be utilized, and Canadian prices would stay even lower. This approach would drive greater abatement than if the Canadian carbon price was fixed exactly to the U.S. price and it would begin to reduce emissions sooner.

In the scenarios presented in **Table 13**, Canadian policy includes a safety valve that is set to float above the U.S. market price, thus limiting the carbon price differential. We explore price differentials to assess implications of leading more aggressively or conservatively. We test this approach by modelling scenarios in which the U.S. implements no policy at all, and in which it implements a policy similar to the Waxman-Markey proposal, which relies extensively on offsets to maintain a low U.S. carbon price.

TABLE 13 ENVIRONMENTAL AND ECONOMIC OUTCOMES OF CONTINGENT CARBON PRICING FOR CANADA

SCENARIO			DOMESTIC GHG REDUCTIONS IN CANADA RELATIVE TO 2005	DOMESTIC GHG REDUCTIONS IN CANADA RELATIVE TO 2020 REFERENCE CASE
CANADIAN POLICY[70]	CANADIAN CARBON PRICE IN 2020 ($/TONNE CO_2e)	U.S. CARBON PRICE IN 2020 ($/TONNE CO_2e)		
CANADIAN SAFETY VALVE SET TO U.S. PRICE + $20	$20	$0 (NO POLICY)	0%	-10%
	$53	$33 (WAXMAN-MARKEY)	-8%	-16%
CANADIAN SAFETY VALVE SET TO U.S. PRICE + $30	$30	$0 (NO POLICY)	-3%	-12%
	$63	$33 (WAXMAN-MARKEY)	-10%	-18%
CANADIAN SAFETY VALVE SET TO U.S. PRICE + $40	$40	$0 (NO POLICY)	-5%	-14%
	$73	$33 (WAXMAN-MARKEY)	-13%	-21%
CANADA LEADS (CANADIAN POLICY IS NOT CONTINGENT ON U.S. POLICY)	$77	$0 (NO POLICY)	-14%	-22%
	$77	$33 (WAXMAN-MARKEY)	-14%	-22%

Setting a higher allowable price differential to that of the U.S. would allow Canada to achieve greater reductions. In all the contingent pricing scenarios in **Table 13**, the Canadian price is insufficient to drive enough domestic abatement to meet Canada's target, though with international permits the +$40/tonne scenario comes close. Importantly, however, Canada achieves some reductions by 2020 no matter what action the U.S. takes. Of even greater importance, a contingent pricing approach establishes long-term policy certainty, which is essential for providing an incentive to firms to invest in low-carbon technology.

Contingent pricing is thus an opportunity for Canada to lead responsibly and manage economic risks, whether the U.S. acts or not. A greater price differential results in higher Canadian carbon prices and slightly reduced economic growth, though since all the contingent policies have smaller carbon prices than the Canada Leads scenario, overall economic impacts are small. We will highlight economic outcomes of these contingent policies combined with alternative revenue recycling approaches in Chapter 5.

70 In these runs, in addition to the domestic abatement shown, additional Canadian compliance is achieved through international permit purchases, and the remainder through technology fund permit purchases. As a result, Canada does not achieve its targets in the contingent policy run, although it does achieve the 2020 target in the Canada Leads run shown at the bottom of the table for context . We will return to these scenarios in Chapter 5 when we propose a Transitional Policy Option for Canada.

4.5 SUMMARY: OPPORTUNITIES FOR CANADA

By exploring approaches to managing the risks for Canada from uncertain U.S. climate policy, Canadian climate policy opportunities become clearer.

IN SUMMARY, WE MAKE THE FOLLOWING FINDINGS:

// **LINKING CANADIAN AND U.S.** cap-and-trade systems provides an opportunity to level the economic playing field between Canada and the U.S. in terms of harmonizing carbon prices while achieving targets. However, without a U.S. system in place, relying on linkage as an approach to address competitiveness and market access risks will mean delays in reducing emissions here in Canada. And, in the short term, the U.S. may not be interested in a fully integrated carbon market with Canada.

// **SPECIFIC POLICY** design mechanisms like a technology fund, as well as international permits and domestic offsets, could represent an opportunity to harmonize carbon prices with those of the U.S. and contain costs. These approaches have trade-offs between realizing domestic emission reductions and reducing competitiveness risks by keeping financial investment in Canada, versus achieving emission reductions elsewhere and sending investment dollars offshore.

// **PERMIT ALLOCATION STRATEGIES** can be used to develop a politically viable and equitable GHG mitigation policy for Canada for regions and industrial sectors. For example, recycling revenue to corporate taxes shows greater benefits for capital-intensive provinces such as Alberta and Saskatchewan while revenue recycling to labour or personal income assists population-intensive provinces such as Ontario and Québec. Similarly, free allocations based on an emissions-intensity benchmark reduce distributional risks for regions with emissions-intensive sectors such as oil and gas extraction in Alberta.

// **A CONTINGENT PRICING POLICY** in which a safety valve is designed to limit the carbon price differential between Canada and the U.S. would walk a middle line between harmonizing with the U.S. on carbon price and on emission-reduction targets, balancing competitiveness and environmental risks. In particular, it would limit competitiveness risks, allow for immediate implementation of a Canadian carbon-pricing climate policy, achieve greater emission reductions than exact alignment with the U.S. price, and generate money to invest in low-carbon technologies and long-term emission reductions in Canada.

A TRANSITIONAL POLICY OPTION FOR CANADA

// CHAPTER 05


TO
CANADA
ONLY

5.0 // A TRANSITIONAL POLICY OPTION FOR CANADA

5.0 A TRANSITIONAL POLICY OPTION FOR CANADA

The NRTEE's role is to consider environmental and economic considerations together when offering policy advice to governments. Climate change policy must fundamentally integrate the two if it is to be successful.

Our goal is to find options that positively integrate both perspectives. In doing so, Canada can make progress on both short- and long-term GHG emission reductions while ensuring our economy continues to prosper. The Round Table's approach is pragmatic, optimistic, and innovative. We seek to build on current climate policy foundations with new thinking and analysis that will assist policy makers to move forward. This chapter considers a new policy option that could help Canada manage the risks that emerge from uncertain U.S. policy. It would provide a path forward for Canada if the U.S. delays implementing a national climate policy. It also reinforces a key recommendation from the NRTEE report *Achieving 2050* — that a national, economy-wide cap-and-trade system be implemented as soon as possible, in anticipation of eventual linkage with a U.S. system. It would allow Canada to make real, tangible progress on reducing our carbon emissions and provide an opportunity to develop a made-in-Canada approach, while transitioning to ongoing harmonization with the United States, maintaining competitiveness, and addressing regional and industry sector concerns.

5.1 THE ESSENTIAL ISSUE FOR CANADA

Canada has committed to harmonizing its climate policy with the U.S. This goal is sensible, but it is not as simple as it sounds.

This report demonstrates the underlying benefits and challenges of harmonizing Canadian climate policy with the United States. Harmonizing offers the prospect of moderating the economic impact overall on Canada of climate policy given the integrated nature of our two economies. The challenges or risks in doing so are that harmonization comes with potential trade-offs between environmental outcomes and economic impacts. Here's why:

FIRST, competitiveness risks from higher Canadian carbon prices relative to those in the U.S. will have implications for sectors that rely heavily on trade and are emissions-intensive. These sectors represent 10% of Canadian GDP.

SECOND, uncertain U.S. climate policy can lead to policy delay here in Canada. There is currently no overall U.S. policy with which Canada can harmonize (vehicle emission standards notwithstanding). But waiting for absolute clarity from the U.S. could mean an undesirable delay in developing and implementing climate policy in Canada. Canada has already moved ahead of the U.S. in signalling that it will regulate emissions from existing coal-fired electricity plants. But carbon pricing policy is required to drive emissions down throughout the Canadian economy and meet emission reduction targets. A later start for carbon pricing policy in Canada has medium- and long-term consequences for Canada in not achieving its stated 2020 emission reduction targets, and will lead to probable higher economic costs in ultimately doing so, as we have demonstrated. It further hinders progress on transitioning to a low-carbon economy necessary for our future competitiveness and success.

FINALLY, given the energy-economy differences between Canada and the U.S., Canada cannot easily harmonize on both carbon prices *and* emission-reduction targets with the U.S. The same carbon price in Canada as in the U.S. leads to fewer reductions in Canada, while the same target leads to higher carbon prices in Canada relative to the U.S. At

the same time, Canadian exports could be exposed to border carbon adjustments if our climate policy is seen as less stringent than U.S. policy; whether this pertains to a lower carbon price or lower targets in Canada is not yet clear.

Uncertainty combined with energy-economy differences with the United States highlights a tension for the scale and scope of Canadian climate policy: Canada will experience some economic impacts from *any* climate policy, both from competitive disadvantage due to higher carbon prices relative to the U.S, and from the costs of reducing emissions from our economy to meet our own policy goals and GHG targets. The former impacts can be reduced by harmonizing with a U.S. carbon price, but the latter impacts are independent of U.S. policy harmonization and could well increase, the longer Canadian policy is delayed.

5.2 SUMMARY OF POLICY OPTIONS

How then, can Canada reduce competitiveness impacts from higher carbon prices in Canada relative to the U.S. while still achieving emission reductions and protecting itself against border carbon adjustments?

Different policy approaches to achieve this goal are possible, but all approaches have trade-offs:

1. // **CANADA COULD REDUCE ITS 2020 GHG TARGET.** Reducing our targets below those of the U.S. would result in lower carbon prices than now anticipated and lead to carbon prices comparable to those of the U.S. This approach would level the competitiveness playing field, but would result in fewer emission reductions. To achieve harmonized carbon prices, NRTEE analysis suggests Canada would have to reduce its target to 8% below 2005 levels by 2020, rather than the current target of 17%.

2 // **CANADA COULD ACHIEVE ITS 2020 TARGET, INDEPENDENT OF U.S. POLICY CHOICES.** While this approach would allow Canada to achieve its 2020 targets no matter what, it would impose a higher carbon price in Canada relative to the United States, particularly in the short term. Canadian trade-exposed and emissions-intensive sectors would be vulnerable to competitiveness risks. Free permit allocations to trade-exposed and emissions-intensive sectors through a national cap-and-trade system could reduce the total costs of the policy for such sectors and firms within them.

3 // **CANADA COULD LINK WITH A U.S. CAP-AND-TRADE SYSTEM.** Linking carbon trading systems would result in a convergence of carbon prices and so create an equal playing field for Canadian and U.S. firms. But two main problems could make linkage problematic for Canada in the short term. First, U.S. action on establishing a cap-and-trade system does not appear imminent and could lead to delays in implementing Canadian climate policy. Second, a linked trading system would result in a higher carbon price in the U.S. than an American-alone system, making linkage potentially less appealing to policy makers there.

4 // **CANADA COULD APPLY A CONTINGENT PRICING APPROACH.** This approach would reduce and limit the carbon price differential between Canada and the U.S. and make up the emissions reduction gap through a combination of international purchases, domestic offsets, and a technology fund. Limiting the carbon price differential between Canada and the U.S. would put Canadian policy somewhere between harmonizing on price and harmonizing on targets. It would limit competiveness impacts by not allowing the Canadian price to be too far out of alignment with the U.S. price. Yet a somewhat higher Canadian carbon price at this time would drive more domestic abatement than a pure price harmonization approach, and provide a stronger incentive for innovation and long-term reductions through greater policy certainty to Canada's industrial, business, and financial sectors.

Table 14 summarizes the trade-offs between the four main options presented above.

TABLE 14 SUMMARY OF POLICY OPTIONS TRADE-OFFS

	ADVANTAGES		DISADVANTAGES	
	ENVIRONMENTAL	ECONOMIC	ENVIRONMENTAL	ECONOMIC
1. REDUCING TARGETS	• None	• Reduced costs of achieving domestic emission reductions • Level competitive playing field between Canada and U.S. through harmonized carbon prices	• 2020 targets not achieved • Long-term reductions more challenging	• May be vulnerable to U.S. border carbon adjustments • Cost of achieving long-term targets is increased • Less development of low-carbon technology; Canada is less competitive in low-carbon markets
2. ACHIEVE TARGETS INDEPENDENT OF U.S. POLICY	• Achieves 2020 targets	• Not at significant risk of border adjustments • Avoids/reduces longer-term costs of delay; reduced cost of long-term reductions given policy certainty • Positions Canada to compete in emerging international low-carbon markets	• None	• Higher carbon price in Canada relative to U.S. leads to competitiveness risks for some sectors • Greater emission reductions imposes greater costs in short term
3. LINKAGE WITH U.S. CAP-AND-TRADE SYSTEM	• Achieves 2020 targets if U.S. moves	• Level competitive playing field between Canada and U.S. through harmonized carbon prices • Lowers Canadian carbon price, reducing costs of policy	• 2020 targets not achieved if U.S. delays action	• Lower carbon price would reduce incentives for technological change and could increase costs of achieving long-term targets
4. CONTINGENT PRICING	• Policy can be implemented immediately • Investment in low-carbon technology will drive long-term reductions • More reductions achieved than the Reducing Targets option	• Competitiveness risks are limited • Costs of achieving long-term targets is reduced • Stimulates development of low-carbon technologies, improving Canadian low-carbon competitiveness	• 2020 targets not achieved	• May be vulnerable to U.S. border carbon adjustments

5.3 THE NRTEE TRANSITIONAL POLICY OPTION

The NRTEE suggests that the fourth option — a contingent pricing approach — could provide the foundation for an effective strategy to manage current competitiveness risks in Canada-U.S. climate policy and achieve a reasonable and realistic balance between environmental and economic objectives.

In this section, we develop the key elements of a possible strategy for Canada to move forward now, building on our analysis of a contingent pricing tool and other policy ideas explored in the previous chapter. This Transitional Policy Option offers an innovative new approach that would allow Canada to drive investment in low-carbon technologies and to achieve real emission reductions. The option fosters policy certainty in Canada even in the wake of uncertainty in U.S. policy direction. It leaves Canada free to adjust and harmonize future climate policy elements with the U.S. as its own policy comes online, setting up Canada for eventual linkage with a U.S. system.

THE TRANSITIONAL POLICY OPTION CONTAINS THE FOLLOWING FOUR ELEMENTS:

1. // **CONTINGENT CARBON PRICING** — to establish a price collar that limits the Canadian carbon price to be no more than $30 / tonne CO_2e higher than the price in the U.S.;

2. // **A NATIONAL CAP-AND-TRADE SYSTEM** — with auctioning of permits and revenue recycling to cap emissions and address regional and sectoral concerns.

3. // **LIMITED INTERNATIONAL PERMITS AND DOMESTIC OFFSETS** — to keep domestic carbon prices lower for Canadian firms, thus maintaining competitiveness, and further harmonizing with U.S. policy direction; and

4. // **TECHNOLOGY FUND** — to keep domestic carbon prices lower for Canadian firms, align carbon prices close to those in the U.S., and stimulate investment in needed emission reductions technologies.

To assess the NRTEE's transitional policy option, we explored modelling scenarios that consider implications both if Canada faces continued uncertain U.S. climate policy or if the U.S. implements a Waxman-Markey-like policy with an economy-wide carbon price through a cap-and-trade system, and extensive offsets that would likely keep the carbon price around $30/tonne CO_2e by 2020. We modelled U.S. policy in these scenarios as a stylized version of Waxman-Markey, as it is broadly representative as a real legislated policy for the U.S. Analyses of proposals such as Waxman-Markey, Kerry-Boxer and Kerry-Lieberman all impose comparable carbon prices of around $30/tonne CO_2e and are thus broadly consistent with our representative scenario.

We find that a price differential of $30/tonne above the U.S. price by 2020 would allow for real emission reductions in Canada while limiting competitiveness implications. This contingent carbon pricing differential acts as a price collar, placing a ceiling on just how high Canadian carbon prices rise. It results in actual emission reductions, which would be a first step down the road to long-term reductions, whether the U.S. implements policy or not. In economic terms, the price differential provides greater price certainty by guaranteeing the carbon price won't rise too much above the U.S. price, but at the cost of quantity certainty in terms of achieving targeted emission reductions. The approach also allows Canada to pilot the institutions required to implement an operational cap-and-trade system for eventual linkage with the United States.

TABLE 15 EMISSION REDUCTIONS IN CANADA UNDER THE TRANSITIONAL POLICY OPTION

	SCENARIO		DOMESTIC GHG REDUCTIONS IN CANADA IN 2020 RELATIVE TO 2005	DOMESTIC GHG REDUCTIONS IN CANADA IN 2020 RELATIVE TO REFERENCE CASE
CANADIAN POLICY	CANADIAN CARBON PRICE IN 2020 ($/TONNE CO_2e)	U.S. CARBON PRICE IN 2020 ($/TONNE CO_2e)		
CANADIAN SAFETY VALVE SET TO U.S. PRICE + $30 (TRANSITIONAL POLICY OPTION)	$30	$0 (NO POLICY)	-3%	-12%
	$63	$33 (WAXMAN-MARKEY)	-10%	-18%

If the U.S fails to implement a cap-and-trade system — and imposes no carbon price — Canada can implement its own modest but initial carbon pricing policy with a maximum carbon price of $30. If the U.S. implements policy as well, the Canadian carbon price can become more stringent to drive more emission reductions, though never become too much out of step with the U.S, thereby maintaining economic competitiveness. The price collar acts to moderate the risks of adverse economic outcomes both nationally and to specific sectors and regions.

NATIONAL CAP-AND-TRADE SYSTEM

The contingent carbon pricing policy is given effect through an economy-wide national cap-and-trade system. A continental or harmonized carbon trading system is stated federal government policy. Several provinces have been actively developing an integrated trading regime with several U.S. states under the Western Climate Initiative. Continuing progress on this front makes sense. As recommended in the NRTEE's *Achieving 2050* report, this would put in place a market-based instrument to allow for the buying and selling of carbon pollution permits by regulated firms or industry sectors. This would generate revenue for government that could be recycled back to firms or provinces to address local competitiveness or economic concerns. One approach would be to allocate some free emissions permits to emissions-intensive and trade-exposed industry based on historical emissions intensity. Tracking how the U.S. is considering this approach and whether similar allocations should be made-in-Canada would add a further level of harmonization. Alternatively, permits could be auctioned and substantial revenue recycled to reducing taxes. Free allocations or recycling to corporate taxes can address regional impacts and prevent revenue from being transferred from capital and emissions-intensive Alberta and Saskatchewan in an inequitable way.[71]

As the NRTEE proposed in *Achieving 2050*, targeted regulations can complement a cap-and-trade system by expanding coverage of the program to include emissions difficult to include under a cap-and-trade system and by addressing market barriers for technological innovation and deployment to enable the carbon price to incent low-carbon technology. Canada could continue to harmonize with the U.S. on regulatory mechanisms as it has on vehicle emission standards.

71 In our modelling of the Transitional Policy Option, we applied a system of full auction with full recycling back to income and corporate tax (50% to each). Our scenarios (as presented in Chapter 4) illustrate that substantial recycling to corporate taxes significantly reduces regional economic impacts. Similar distributional outcomes could be achieved with different approaches to providing allocations for free based on some combination of output or emissions intensity.

ACCESS TO INTERNATIONAL PERMITS AND DOMESTIC OFFSETS

Since international reductions will likely be available at a relatively lower cost than in Canada, allowing firms to comply with a cap through international permits would allow greater global emission reductions as a result of Canadian policy, without the very high carbon price required under a Canada-only approach. If the international carbon permits purchased are credible, this approach would not reduce the environmental credibility of the policy, though other concerns about equity issues and perverse effects of offset funding in the developing world could emerge. However, investment in international reductions would result in financial flows out of Canada, representing lost opportunity to invest in reductions within Canada.

Similarly, domestic offsets from Canadian forestry and agriculture could provide lower-cost reductions if complementary regulations cannot be used to drive reductions in these sectors. Indeed, the low carbon price expected in the U.S. under policies such as the Waxman-Markey bill is largely due to expectations that a large share of U.S. emission reductions will come from land-use changes that increase forests' ability to act as a carbon sink. Again, this approach will constrain costs while still achieving emission reductions, as long as institutional capacity exists to ensure that the land-use changes are permanent and would not have happened without the offset investment. Nevertheless, if these cost-containment mechanisms are available to American firms, they should also be available to Canadian firms as part of a harmonized policy approach between the two countries.

Use of both international and domestic offsets would be limited to ensure that the bulk of compliance would be achieved through domestic abatement or investment in low-carbon technologies in Canada. A finite percentage of compliance for Canadian firms would be allowed through these mechanisms.[72]

TECHNOLOGY FUND

As part of contingent pricing, Canada could set a maximum carbon price through a safety valve such as a technology fund. Firms could purchase additional emissions permits from the government at a fixed price (set at no more than $30 above the U.S. carbon price). The government revenue generated from these purchases would be deposited into a new, national Low-Carbon Technology Fund devoted to the development and deployment of

72 In our modelling analysis of the Transitional Policy Option, international permits are limited to 25% of compliance, and only domestic landfill gas offsets are included.

low-carbon technologies. NRTEE analysis suggests that the fund would generate revenue of around $0.5 billion in 2020 if both countries implemented policy, and around $2.0 billion if only Canada implemented policy. **Table 16** below compares the approximate levels of revenue that could be expected from these two scenarios. To put these values in context, in *Achieving 2050*, the NRTEE found that to achieve Canadian targets, additional investment in low-carbon technologies as a result of policy would have to reach around $2.2 billion a year, so clearly some progress would be made now, better positioning Canada for the future.

TABLE 16 ESTIMATE OF LIKELY REVENUE FROM PROPOSED TECHNOLOGY FUND IN 2020[73]

TRANSITIONAL POLICY OPTION IF THE U.S IMPLEMENTS POLICY COMPARABLE TO WAXMAN-MARKEY	TRANSITIONAL POLICY OPTION IF THE U.S. DOES NOT IMPLEMENT POLICY
APPROXIMATELY $0.5 BILLION / YEAR IN 2020	APPROXIMATELY $2.0 BILLION / YEAR IN 2020

5.4 ECONOMIC OUTCOMES OF THE TRANSITIONAL POLICY OPTION

What would be the economic outcomes of this policy option? NRTEE modelling suggests that this approach successfully manages the trade-offs between different risks.

It successfully accommodates either action or inaction by the United States. Forecasted economic impacts are generally small and manageable. This is for two main reasons: first, the carbon price differential between Canada and the U.S. is limited and second, the absolute magnitude of the Canadian price is contained. As illustrated in **Table 17**, economic growth is healthy and not significantly reduced from the expected average growth rate in the absence of policy, of 2.1% per year. To further moderate economic impacts, the maximum price differential could be phased in over time.

73 The revenue to be generated may vary given that the costs of abatement and methods by which firms will comply with a policy are unknown However, these values are estimated for the Alberta and *Turning the Corner* funds based on assumptions from published material on the policies.

TABLE 17 ECONOMIC OUTCOMES UNDER THE TRANSITIONAL POLICY OPTION

POLICY SCENARIO		CANADIAN CARBON PRICE IN 2020	U.S. CARBON PRICE IN 2020	ANNUAL GDP GROWTH RATE IN CANADA (REFERENCE CASE IS 2.1%)	CHANGE IN NET EXPORTS FROM REFERENCE CASE ($ BILLION)
CANADIAN POLICY	U.S. POLICY				
CANADA IMPLEMENTS TRANSITIONAL POLICY OPTION	U.S. IMPLEMENTS WAXMAN-MARKEY	$63/TONNE	$33/TONNE	2.0%	$8.4
CANADA IMPLEMENTS TRANSITIONAL POLICY OPTION	U.S. IMPLEMENTS NO POLICY	$30/TONNE	$0/TONNE	2.0%	$1.8

The Transitional Policy Option moderates regional impacts both by limiting the U.S.-Canada carbon price differential and through the associated revenue recycling approach. Recall that the contingent pricing policy is part of a national, economy-wide cap-and-trade system designed to establish and communicate the price signal. The cap-and-trade system will generate revenue through the auctioning of carbon permits by 2020. Based on NRTEE modelling revenue recycling to corporate income tax reductions clearly lessens the economic impact on capital-intensive industries, such as oil and gas, which are principally located in Alberta and Saskatchewan. As shown in **Table 18**, Alberta still experiences greater economic impacts than other provinces but nevertheless experiences substantial economic growth due to this revenue recycling. Growth in all regions and sectors is still healthy in 2020. This approach helps to meet objections about wealth redistribution from carbon-intensive jurisdictions arising through climate change policy.

TABLE 18 PROVINCIAL GDP IMPACTS OF THE TRANSITIONAL POLICY OPTION

POLICY SCENARIO			FORECASTED AVERAGE ANNUAL GDP GROWTH, 2005 - 2020						
	CANADIAN CARBON PRICE IN 2020	U.S. CARBON PRICE IN 2020	BC	AB	SK	MN	ON	QC	AT
REFERENCE CASE	$0 / TONNE	$0 / TONNE	2.3%	2.1%	2.3%	2.1%	2.3%	1.8%	1.7%
TRANSITIONAL POLICY OPTION IF U.S. IMPLEMENTS WAXMAN-MARKEY	$63 / TONNE	$33 / TONNE	2.2%	1.9%	2.2%	2.2%	2.2%	1.8%	1.6%
TRANSITIONAL POLICY OPTION IF U.S. DOES NOT IMPLEMENT POLICY	$30 / TONNE	$0 / TONNE	2.2%	2.0%	2.2%	2.1%	2.2%	1.8%	1.6%

The limited price differential reduces the sector-level impacts on trade- and carbon-exposed sectors, as illustrated in **Figure 22**. Average annual growth in all vulnerable sectors is only slightly reduced from the reference case, and remains positive in all sectors expected to grow under the reference case. Again, some of these trade impacts are the results of reducing emissions in emissions-intensive sectors in Canada and consequent reduced production; these costs cannot be avoided if Canada is to achieve long-term reductions.

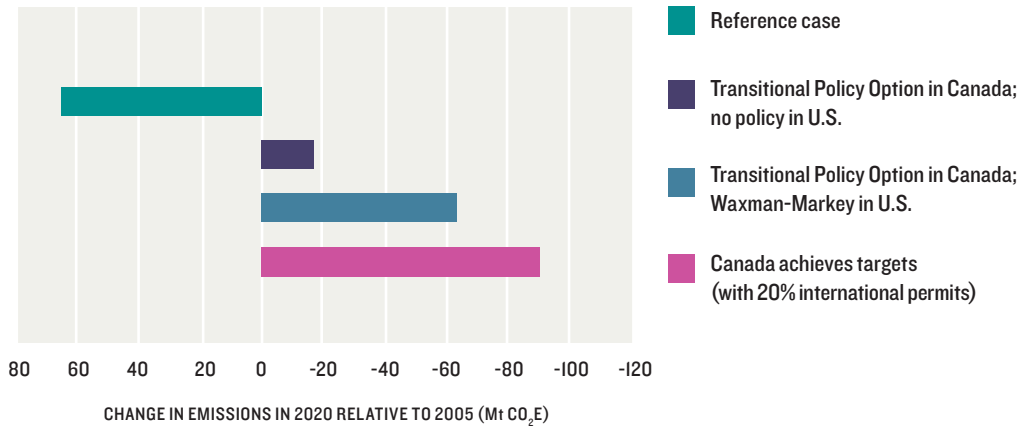
FIGURE 22 AVERAGE ANNUAL GROWTH RATES 2005–2020 FOR CANADIAN EMISSIONS-INTENSIVE AND TRADE-EXPOSED SECTORS UNDER THE TRANSITIONAL POLICY OPTION SCENARIOS

5.5 ENVIRONMENTAL OUTCOMES OF THE TRANSITIONAL POLICY OPTION

What would be the environmental outcomes of this Transitional Policy Option?

We selected a $30 maximum differential as a balanced and responsible approach to achieving significant reductions but that also ensures manageable impacts. **Figure 23** illustrates the environmental side of this trade-off. It shows the domestic Canadian emission reductions achieved under the policy proposal relative to 2005 levels and the reference case.

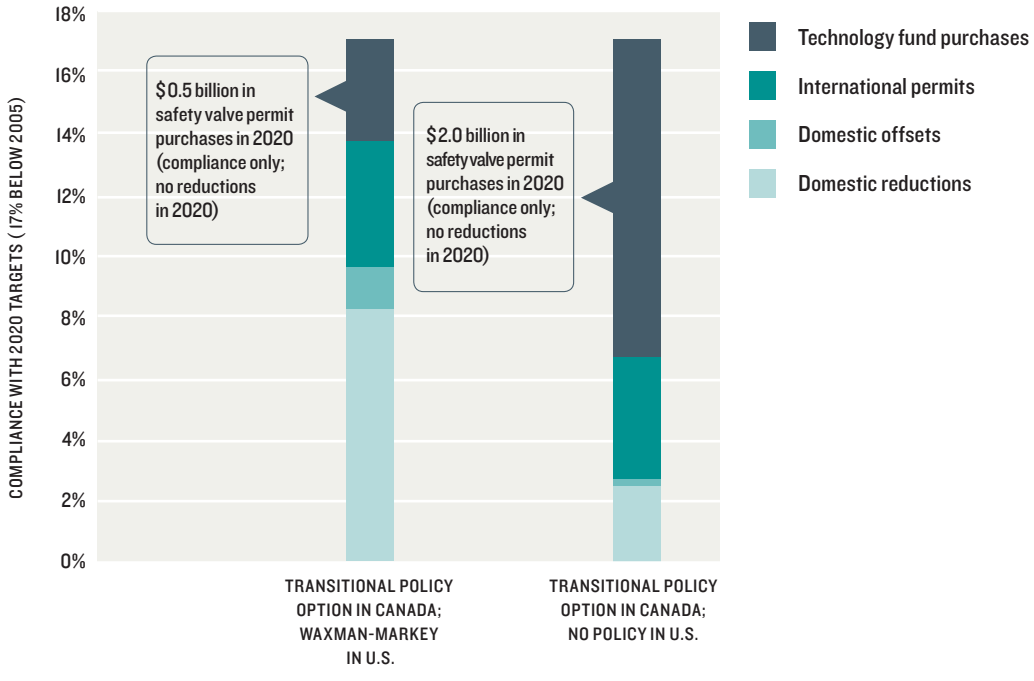
FIGURE 23 ESTIMATED EMISSION REDUCTIONS IN 2020 RELATIVE TO 2005 UNDER THE TRANSITIONAL POLICY OPTION



Under the Transitional Policy Option, Canada's emissions in 2020 would be lower than 2005 levels whether the U.S. implements policy or not. But more importantly, the Transitional Policy Option would curtail the large emissions growth that would occur under the reference case, setting Canada on the path toward long-term emissions reductions.

Under the Transitional Policy Option, Canadian firms will achieve compliance with the policy in different ways, depending on whether or not the U.S. implements policy. **Figure 24** shows the breakdown of emission reductions by method of compliance likely to be used for Canadian firms to comply with their share of a Canadian emissions cap. It illustrates that if the U.S. did not implement policy and the carbon price was limited in Canada, the lower Canadian carbon price would result in less domestic action, both in terms of emission reductions and domestic offsets. The compliance gap to the overall cap would need to be made up through additional investments in the technology fund. Note that if low-cost international reductions from developing countries were not available, the carbon price under the Transitional Policy Option would still not be affected. However, it would result in less compliance achieved through international permits and more compliance achieved through the technology fund.

FIGURE 24 CANADIAN COMPLIANCE IN 2020 FOR THE TRANSITIONAL POLICY OPTION



The Transitional Policy Option brings about real carbon abatement and emission reductions in Canada whether the U.S. implements equivalent policy or not. NRTEE modelling shows that Canada would achieve a 10% reduction in domestic emissions relative to 2005 levels if the U.S. implemented policy, and a 3% reduction if the U.S. continued to lag. This means Canadian emissions growth would be arrested and on a path to being reduced altogether. Since contingent policy is a transitional measure designed to move Canada forward on climate policy in the face of continued U.S. policy uncertainty, there is an initial emphasis on cost containment. This means that a significant amount of emission reductions would occur through compliance mechanisms such as the purchase of international permit purchases and/or the purchase of safety valve compliance permits through a technology fund. Both have implications for GHG emissions. Efforts would have to be made to ensure that international permits were real, credible, and verifiable, and not merely so-called hot-air permits that do not represent real reductions. Use of the safety valve would also reduce environmental effectiveness for 2020, but since revenues from the safety valve would be recycled to technology, it would provide financing for key technologies important for long-term reductions.

In the short term, the Transitional Policy Option would increase the development and implementation of low-carbon technologies because it provides a clear price signal to the economy, no matter what policy choices the U.S. makes. However, to address risks of competitiveness, the option limits, or caps, the Canadian carbon price and thus the incentives for more costly low-carbon technologies as well. Of particular risk for Canada is that the price is kept below thresholds at which CCS becomes economically viable. In the long term, CCS could be a critical technology for Canada's oil and gas industries to remain competitive in a low-carbon global economy. The Transitional Policy Option by itself could limit expectations for high Canadian carbon prices over the medium term, and thus inhibit the development of CCS and other technologies.

To help address this issue, the Transitional Policy Option we put forward would devote revenue from the safety valve to a new Canadian low-carbon technology fund focused on research and development and on commercialization of low-carbon technologies, including CCS. The technology fund included here would generate a significant amount of revenue for low-carbon technologies that, invested and managed properly, could lead to ongoing emission reductions.

5.6 SUMMARY: A TRANSITIONAL POLICY FOR CANADA

The policy option considered in this chapter achieves the main goals of this study:

1. // To set Canada on a path toward achieving deep, long-term emission reductions at least cost, no matter what policy choices are made in the U.S.; and

2. // To minimize adverse national, regional, and sectoral impacts from U.S. and Canadian climate policy as much as possible. The option would achieve real emission reductions.

This made-in-Canada Transitional Policy Option presents an opportunity for Canada to lead responsibly on climate policy, ensure appropriate harmonization with the United States, build on existing federal and provincial/territorial policy approaches, and manage both environmental and economic risks for Canadians.

CONCLUSIONS AND RECOMMENDATIONS

// CHAPTER 06

6.0 // CONCLUSIONS AND RECOMMENDATIONS

6.0 CONCLUSIONS AND RECOMMENDATIONS

This report proposes a path forward through economic risks and opportunities of Canadian and U.S. climate policy choices.

The federal government has indicated that Canadian climate policy will be harmonized with U.S. climate policy as much as possible given the integrated nature of our two economies. Overall, this is a sensible and realistic approach.

But how we pursue that goal matters just as much. As the U.S. struggles internally with its domestic climate policy, Canada must protect its own interests, both environmentally and economically. This report explores the key risks that Canada must navigate given uncertain American climate policy and potential delays in the U.S. moving forward. Canada faces some economic competitiveness risks in moving too far ahead of the U.S., but also faces both environmental and economic risks by simply waiting. Delay leads to rising carbon emissions each year, and a higher financial and economic cost in ultimately acting to meet our stated GHG emission targets for 2020 or beyond. Neither outcome is desirable or inevitable.

Four key conclusions on Canada-U.S. climate policy harmonization emerge from our research and analysis:

// **HARMONIZING** on carbon targets and harmonizing on carbon price have different consequences. Canada's distinctive emissions profile and energy-economy structure mean that matching our GHG targets with those of the U.S leads to higher carbon prices here. Alternatively, while matching carbon prices with those in the U.S. would reduce competitiveness concerns, fewer emission reductions would actually occur due to projected higher emissions growth in Canada than in the U.S. As a result, Canada would not meet its stated 2020 target.

// **COMPETITIVENESS** issues matter, but they matter most for about 10% of Canada's economy that is considered emissions-intensive and trade-exposed, including sectors such as oil and gas extraction, and cement manufacturing. Knowing this allows us to take mitigating actions that reduce the impact on those sectors and regions of the country through targeted policy measures.

// **TRADE MEASURES** in U.S. legislative proposals and low-carbon fuel standards do pose an economic risk for key Canadian sectors but these risks can likely be managed if Canada adopts equally stringent climate policy as the United States. Acting remains the best preventative measure.

// **COSTS IMPOSED** by Canada's own climate policies and resulting emissions reductions have the most impact on Canadian industry. It is not just costs from U.S. policy actions or from differences between Canadian and U.S. policies that matter. This means some costs will be present regardless of when Canada implements its full suite of climate policy actions.

Taking these conclusions into account, the NRTEE offers a path toward achieving the government's goal of climate policy harmonization with the United States. And, we need to consider our own steps if the U.S. fails to move. Canada needs to strategically plan for harmonization. We need to ensure we use this time and opportunity to prepare for low-carbon economic success by investing in and developing new environmental technologies.

Regulatory steps taken by the government to reduce emissions on both a harmonized and independent basis with the U.S. provide an important base for more action. They can be complemented and reinforced with a clear carbon price signal as set out by the NRTEE in its Transitional Policy Option.

The NRTEE therefore recommends that the government of Canada consider the merits of a transitional, made-in Canada strategy for harmonization.

This phased approach would ensure we are ready and prepared to harmonize effectively and advantageously if the U.S. is ready to move. It would start us on the path to prepare Canada's economy for a low-carbon transition with a modest, initial, but real carbon price signal leading to new investments in clean-energy technologies and to actual GHG emission reductions that would change our current carbon growth path once and for all. And, as we start on this path, we can adjust our own efforts as needed depending upon U.S. actions. In this way, we get ahead of the curve, but carefully so, ensuring impacts on Canada are manageable.

This transitional harmonization strategy for Canada would consist of two main steps:

1. // **IN THE SHORT TERM,** Canada could implement a Transitional Policy with the following elements:

   // **CONTINGENT CARBON PRICING** — to establish a price collar that limits the Canadian carbon price to be no more than $30 / tonne CO_2e higher than the price in the U.S.;

   // **NATIONAL CAP-AND-TRADE SYSTEM**— with auctioning of permits and revenue recycling to cap emissions and address regional and sectoral concerns;

   // **LIMITED INTERNATIONAL PERMITS AND DOMESTIC OFFSETS** — to keep domestic carbon prices lower for Canadian firms, thus maintaining competitiveness and further harmonizing with U.S. policy direction; and

   // **TECHNOLOGY FUND** — to keep domestic carbon prices lower for Canadian firms, align carbon prices close to those in the U.S., and stimulate large-scale investment in needed emission reductions technologies.

2. // **IN THE LONGER TERM,** if the U.S. eventually implements its own cap-and-trade system and when it is willing to link with a Canadian system, an integrated North American carbon market could be established. The resulting common carbon price between Canada and the U.S. would level the competitive playing field for Canadian industries. But, because of our own earlier action, we would be ready for this eventuality.

Implementing this phased strategy could have clear benefits for Canada.

FIRST, MAINTAINING COMPETITIVENESS AND ECONOMIC GROWTH: Setting a contingent price on carbon would incent emission reductions here in Canada, but would collar that carbon price at an affordable level to ensure the Canadian price does not get too far ahead of the price in the United States. Given current economic circumstances, the price can be ramped up over time to avoid any immediate economic shock, to ensure continued economic growth in all regions, and to bring about increasing emission reductions over time. Carbon pricing is put into effect through an economy-wide cap-and-trade mechanism building on provincial actions in this area and reinforcing stated federal government intentions.

SECOND, DRIVING CLEAN TECHNOLOGY INVESTMENT: Under the Transitional Policy Option, Canada would invest significantly in technology by creating a new Canadian Low-Carbon Technology Fund worth between $500 million and $2 billion in 2020 depending upon the carbon price set. This fund would be financed through the compliance investments of carbon-polluting firms, but recycled back via investment in new low-carbon technologies such as carbon capture and storage, green energy, and energy-efficiency.

THIRD, ENSURING REGIONAL AND SECTORAL EQUITY: Recycling revenue mostly back to the carbon emitters through reduced corporate taxes and technology investment prevents financial redistribution of carbon wealth across the country. It also ensures that financial flows stay mostly within Canada for our own investment purposes rather than leave to buy international carbon credits offshore.

FOURTH, MANAGING RISKS OF AMERICAN CARBON PROTECTIONISM: The Transitional Policy Option reduces the risk of border carbon adjustments from the U.S. Congress and American government by having Canada lead responsibly and smartly. Canadian carbon prices would be more stringent than in the U.S.

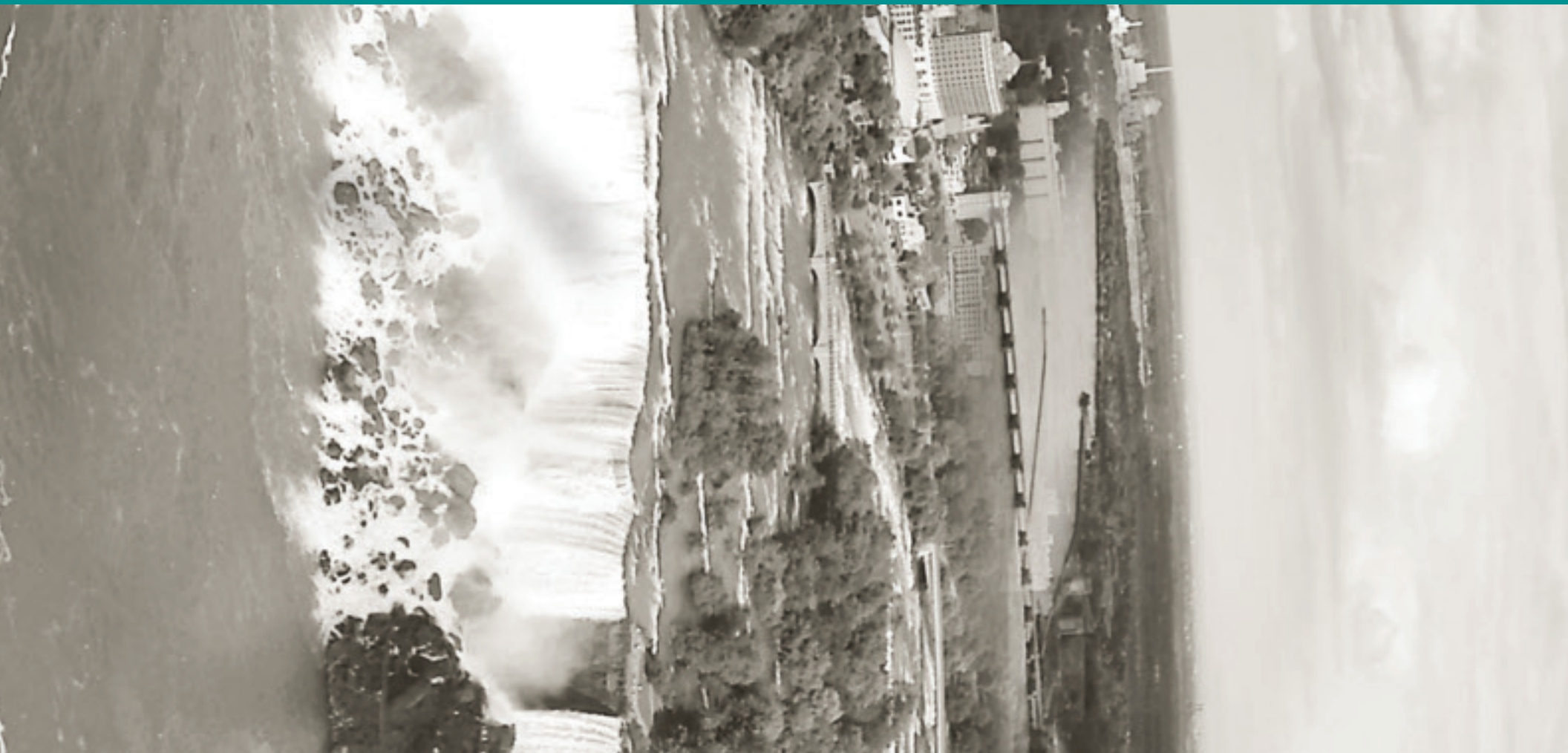
FIFTH, PREPARING CANADA FOR HARMONIZATION: Moving ahead of the U.S. in the short term would allow Canada to develop institutions to manage a cap-and-trade system and to learn from and improve the system over time. An integrated Canada-U.S. carbon market would ensure firms in neither country face competitive disadvantage from carbon prices. It would allow Canada and the U.S. to move together toward achieving deep reductions in the long term. And since the Canadian cap-and-trade system would already be operational, Canadian emissions would have already been reduced, Canadian firms would be familiar with emissions trading, and overall, Canadian industry would be well positioned moving into an integrated market.

SIXTH, ACHIEVING REAL GHG EMISSION REDUCTIONS: Canada's current upward growth in emissions would be arrested and start to be reduced, putting us firmly on the path to our 2020 target. The clear, economy-wide carbon price would send the signal to firms and households in Canada to invest in low-carbon technologies, which would be developed and deployed in Canada.

No single climate policy option is risk-free; realistically, each entails some costs. But, if Canada desires to achieve its stated environmental goals of GHG emission reductions within a certain period, we will need to consider additional steps now, independent of U.S. actions and policy uncertainty. Minimizing Canadian economic costs and competitiveness risks as we do so is realistic and appropriate for policy makers to consider. The NRTEE's Transitional Policy Option offers one way of doing so.

APPENDICES

// CHAPTER 07



7.0 // APPENDICES

7.1 GLOSSARY OF KEY TERMS

TERMS	DEFINITION
ABATEMENT	*Abatement* is actual reduction in greenhouse gas emissions.
ADDITIONALITY	When funds are used to pay for technologies or actions that reduce emissions, the resulting emissions reductions are "additional" only if the reductions would not have occurred in the absence of those funds and if the reduction will not be reversed after the payment. Emissions reductions from offsets, for example, are not always *additional*.
ALLOCATION	*Allocation* refers to the method by which emission permits are distributed in a cap-and-trade system. The emission permits themselves are also sometimes known as "allocations." Typically, permits can be allocated freely or auctioned by government.
ALIGNMENT	In this report, we use *alignment* to represent an approach to harmonizing Canadian carbon prices with U.S. carbon prices through Canadian policy design choices (such as cost containment).
AUCTION	*Auctions* are one way to distribute permits in a cap-and-trade system; they require firms to bid on all permits required to meet the cap.
BORDER CARBON ADJUSTMENTS (BCAs)	*Border Carbon Adjustments* (BCAs) are an approach to addressing competitiveness issues through: 1) requiring imported goods to pay for un-priced carbon emissions costs; and/or 2) relieving exports of their expected emissions costs. Their aim is to "level the playing field" for firms either in domestic or international markets. In this report, our analysis focuses primarily on U.S. import tariffs, represented in the Waxman-Markey bill as International Allowance Reserves, a form of BCA.
CAP-AND-TRADE	Also known as a "tradable allowance system," a *cap-and-trade* policy involves setting the annual level of emissions by issuing emission permits (allowances). If individual emitters produce more emissions than they have permits, they can purchase additional permits. Governments can fix the level of emissions by choosing the number of permits to issue, but the price of permits will be set by the market, and is thus uncertain.
COMPETITIVENESS	*Competitiveness* issues are possible adverse implications of emissions pricing that result if Canada implements an emissions pricing policy that is more stringent than those of its trading partners. Canadian firms would thus have additional costs due to emissions that place them at a disadvantage relative to international competitors.
COMPLIANCE	*Compliance* refers to how firms meet the cap set by policy on their emissions. Compliance could be achieved through reducing emissions (or *abatement*), or through purchasing additional permits on the carbon market, on the international permit market, or from a government *safety valve*.

CONTINGENT PRICING	In this report, a *contingent pricing* policy is a policy in which the Canadian carbon price is conditional on the U.S. carbon price, but is not aligned identically. This policy uses a *safety valve* to limit the difference in carbon prices between Canada and the U.S.
COST CONTAINMENT	*Cost containment* refers to policy design mechanisms used to reduce the carbon price in a cap-and-trade system. Examples of cost containment include a safety valve or price ceiling, which sets a maximum carbon price, or increased access to offsets, which can reduce the costs of compliance and reduce the market price of carbon in the trading system.
COVERAGE	A carbon pricing policy can be applied to different greenhouse gas emissions, different sectors of the economy, and different emissions sources. This is known as the *coverage* of the emissions pricing policy.
DISTRIBUTIONAL EFFECTS	*Distributional effects* refer to the extent to which a policy design will result in disproportionate impacts on different regions, sectors, or households; the criterion assesses issues of equity.
ECONOMIC EFFICIENCY	*Economic efficiency* refers to the extent to which a policy minimizes total costs, including the cost of compliance with the policy as well as transaction costs. Economic efficiency is also increased if a policy addresses other existing economic distortions or market failures.
ENVIRONMENTAL EFFECTIVENESS	*Environmental effectiveness* refers to the extent to which a policy design accomplishes its objective in reducing carbon emissions and lowering atmospheric concentrations of greenhouse gas emissions.
LEAKAGE	*Leakage* refers to the relocation of greenhouse-gas-emitting firms or activities to other jurisdictions to avoid the costs of an emissions pricing policy. In this case, the policy has not reduced the total number of emissions, merely caused their point of origin to change. Since climate change is a global issue and the source of emissions does change their impact, leakage reduces the effectiveness of the policy.
LINKAGE	*Linkage* involves allowing the trade of emissions permits between two or more cap-and-trade systems. For example, a linkage exists between systems A and B, if firms in jurisdiction A can receive credit for emissions permits allocated in jurisdiction B. Linkages can be one or two-way depending on whether both jurisdictions accept the others' credits as valid for achieving compliance.
LOW-CARBON FUEL STANDARD (LCFS)	A *low-carbon fuel standard* is a regulation that mandates a decreasing carbon content in the total pool of transportation fuels.
MARGINAL ABATEMENT COST	Emissions reductions usually involve some cost, often the cost of investing in new technologies or processes. The cost of reducing emissions is known as the abatement cost. The *marginal abatement cost* is an economic concept, which refers to the cost of one extra unit of reductions (that is, the cost of a marginal increase in abatement).

MARGINAL ABATEMENT COST (MAC) CURVE	A *marginal abatement cost curve* shows the incremental costs of different levels of abatement associated with a range of abatement levels. It can be used to highlight how different carbon prices will drive different levels of abatement.
OFFSETS	*Offsets* are emissions reductions that are "created" outside any regulated system, and sold to regulated emitters. Regulated emitters can use offsets, instead of permits, to comply with the carbon-pricing policy. Because emissions reductions from changes in forestry, agriculture, or landfill gas practices are difficult to include under a cap-and-trade system directly, including these reductions as offsets can allow firms to take advantage of potentially lower cost reductions in these areas, reducing the overall costs of the policy.
OUTPUT-BASED ALLOCATIONS	*Output-based allocations* refer to permits allocated for free, for which the firm allocation is updated based on a current or lagged metric of production such as tonnes of output or value of production. The per-unit allocation is a benchmark based on a sector-wide metric such as an average emissions intensity, a percentage of historical average emissions intensity, or average value added.
PRICE CEILING	A *price ceiling* is a maximum carbon price imposed in a cap-and-trade system. It is a form of cost-containment, and can be implemented using a *safety valve* mechanism.
PRICE COLLAR	In this report, a *price collar* is the maximum carbon price differential allowed between carbon prices in Canada and the U.S. under a *contingent pricing* policy.
REFERENCE CASE AND POLICY SCENARIO	The *business-as-usual* — or *reference case* — scenario is the forecast of emissions in the absence of additional policies. The policy scenario is the forecast of emissions when a given policy or suite of policies is implemented. The difference between the emissions forecasts for the two scenarios equals the emissions reductions expected to be induced by the policies included in the policy scenario.
REVENUE RECYCLING	*Revenue recycling* is an element of policy design determining how government revenue (accrued through either a carbon tax or the auctioning of permits in a cap-and-trade system) will be allocated. Possible approaches to revenue recycling include: reducing existing taxes (for example, corporate or income taxes), providing support for competitiveness issues, funding support for technological deployment and research and development, or addressing adverse distributional effects.
SAFETY VALVE	A *safety valve* is a cap-and-trade design mechanism to set a maximum permit price. By selling additional permits directly at this price, government can limit the magnitude of the market price of carbon.
TECHNOLOGY FUND	When govenment revenue from a safety valve is reinvested in low-carbon technology research, development, and deployment, it is known as a *technology fund*.

7.2 THE NRTEE'S APPROACH TO ASSESSING RISKS

In Chapter 3 of this report, economic and environmental risks for the three main scenarios – Canada Lags, Canada Leads, Canada Harmonizes – were assessed.

To aid in our assessment, we created a Canada-U.S. Climate Policy Risk Matrix to illustrate which risks arise from each scenario. In order to present as comprehensive an illustration of risks as possible, we took a two-step approach. The matrices below illustrate this approach.

As risk is commonly defined as a combination of magnitude and likelihood of impacts, the first matrix explores the *magnitude of impacts* from each scenario, characterized as weak, medium, or strong. This assessment strictly focuses on the expected magnitude of the impact with no other factors considered. The second matrix then explores the *likelihood of that impact* occurring, characterized as unlikely, possible or likely. While there are three classifications of magnitude and likelihood in the first two matrices, the combined matrix has four. The distinction is the addition of *very low risk* in the third matrix which is applied to those scenarios where there is an overlap of low impact (magnitude) from the first matrix and unlikely impact (likelihood) from the second.

Because the nature of each risk is different, it cannot be compared against the others using the same metrics. For example, a competitiveness risk could be assessed partly based on GDP impacts resulting from different scenarios. The low-carbon transition, risk, however, is based on an assessment of how well a policy scenario positions Canada to compete in future low-carbon technology markets; this impact is outside both the scope and timeframe of our modelling framework. Therefore, the analysis is both quantitative and qualitative. The analysis of the risks that are more qualitative in nature is the result of extensive analysis of current climate policy issues in both Canada and the U.S. and from expert stakeholder input. Although no scenario is entirely risk-free, our quantitative and qualitative analysis allows us to characterize these risks and so identify policy choices for Canada that offer the narrowest range of risks or those that could be the most manageable.

FIGURE B1 MAGNITUDE OF IMPACTS FOR CANADA

RISKS	ECONOMIC RISKS				ENVIRONMENTAL RISKS	
	COMPETITIVENESS	DISTRIBUTIONAL	MARKET ACCESS	LOW-CARBON TRANSITION	TARGET ACHIEVEMENT	CUMULATIVE EMISSIONS
CANADA LAGS	WEAK	WEAK	MEDIUM	STRONG	STRONG	STRONG
CANADA LEADS	MEDIUM	STRONG	MEDIUM	WEAK	WEAK	WEAK
CANADA HARMONIZES ON TARGETS	MEDIUM	STRONG	MEDIUM	WEAK	WEAK	WEAK
CANADA HARMONIZES ON PRICE	WEAK	MEDIUM	MEDIUM	WEAK	MEDIUM	MEDIUM

FIGURE B2 LIKELIHOOD OF IMPACTS FOR CANADA

RISKS	ECONOMIC RISKS				ENVIRONMENTAL RISKS	
	COMPETITIVENESS	DISTRIBUTIONAL	MARKET ACCESS	LOW-CARBON TRANSITION	TARGET ACHIEVEMENT	CUMULATIVE EMISSIONS
CANADA LAGS	LIKELY	LIKELY	UNLIKELY	UNLIKELY	UNLIKELY	UNLIKELY
CANADA LEADS	UNLIKELY	UNLIKELY	LIKELY	LIKELY	LIKELY	LIKELY
CANADA HARMONIZES ON TARGETS	LIKELY	LIKELY	UNLIKELY	UNLIKELY	UNLIKELY	UNLIKELY
CANADA HARMONIZES ON PRICE	UNLIKELY	LIKELY	POSSIBLE	LIKELY	LIKELY	POSSIBLE

7.3 OVERVIEW OF THE GEEM MODEL

For this report, we applied a new version of the GEEM model, NA-GEEM (North America General Equilibrium Emissions Model).

GEEM is a static computable general equilibrium (CGE) model. Designed to capture the Canadian regional economies as a whole as well as the U.S. economy, it integrates consumer demand, labour and capital supply, and the markets for all key inputs and outputs. NA-GEEM is different from previous GEEM versions in that it explicitly represents both Canada and the United States. Representing this complex system comes at the cost of simplifying assumptions. These assumptions are discussed below.

NA-GEEM treats commodities differently based on whether their prices are set regionally, in North American markets, or in world markets. The U.S. and Canada are assumed to be price takers for crude oil, natural gas prices are set at a North American level, electricity prices are set at the provincial/regional level, and all other goods' prices are set at the national or provincial level as appropriate.

NA-GEEM assumes that all markets *clear*; that is, prices adjust until supply equals demand. Most markets are assumed to be perfectly competitive, such that producers never make excess profits. However, an exception is made for the upstream oil and gas sectors, which are assumed to earn extra profits due to resource rents, which are shared among the producers and provinces. The presence of resource rents makes the oil and gas sector less susceptible to declines in output than other sectors, as the size of rents can decline while the sector remains profitable. However, output from the oil and gas sector may still decline as a function of costs from the sector (i.e., an increase in costs will remove marginal plants from production), and this relationship is based on 2009 data from the National Energy Board.

The version of GEEM we used in this report models the available North American investment capital as a fixed quantity. Capital investment can move between different North American sectors or regions in response to a policy, but there are no net inflows or outflows, and overall level of investment remains constant. As such, NA-GEEM does not explicitly model the accumulation and depreciation of capital, so it cannot model

incentives for more or less total investment. The upshot of the model's capital investment assumption is that capital that otherwise would have been invested in energy or GHG-intense industries moves to less GHG-intense industries, such as services and other manufacturing. Significant capital also migrates into the electricity sector, as it converts from fossil-fuel to less fossil-fuel-intense generation technologies, and the economy as a whole switches to electricity from fossil fuels.

Our analysis may overestimate the degree to which capital will migrate from the GHG-intense sectors to the less-GHG intense sectors instead of internationally, and the degree to which North American overall world savings are transformed into investment capital in an environment where climate policy is applied, but a review of the capital literature shows that capital is not yet perfectly liquid (i.e., it does not move across borders and between regions with perfect ease in search of higher returns), and that savings (the source of investment capital) created in North America will preferentially remain in North America or any other source region.

Like most CGE models, NA-GEEM makes use of production functions to depict technology and production, which assume a smooth substitution between all inputs at a given rate. In certain industries, such as services, there does seem to be a relatively smooth substitution between capital, labour, energy, and materials. In other industries, such as electricity production or the iron and steel industry, substitution is not as smooth since fundamentally different technologies can produce the final product. This phenomenon is not confined to industry; natural gas furnaces or electric resistance heaters can both be used to heat buildings, but have completely different capital and operating costs, energy use, and emissions profiles. Bottom-up models – including the model that evolved into the CIMS model, which the NRTEE has used in past work – were designed to explore these issues. To better align GEEM to CIMS with available time and resources, we used a method borrowed from the MIT-EPPA model[74] and altered the production functions for the crude oil, natural gas, and electricity sectors to allow them to employ discrete technologies to reduce emissions.

GEEM is a static model in that it models policies and outcomes only in 2020 and does not explicitly represent the pathways from 2005 to 2020. Static CGE models, though a credible and tested tool for macroeconomic analysis, are significantly less complex than dynamic CGE models. This simpler approach was necessary in this case given the complexity of other aspects of the model under the general equilibrium framework, including accounting for multiple regions within Canada and the flows of trade and permits between Canada and the U.S.

74 McFarland et al. (2004); Sue Wing (2008).

GEEM is calibrated to the 2005 structure of the U.S. and Canadian economies, the most recent dates for which data is available.[75] This calibration creates a base structure from which the model adjusts under different scenarios. If the chosen year is unrepresentative or if economic or technology structure changes quickly between now and 2020, the outputs of the model may be biased. However, using known economic structures grounds the model in the real world, and policy outcomes are then representative of the current economic structures.

While GEEM does not model non-energy related sources of emissions such as forestry and agriculture, it does model landfill gas emissions. This is a necessary limitation of our approach as non-energy sources of emissions are very different from other sources of emissions. However, over 80% of emissions in Canada are energy-related. Given that current U.S. policy proposals, such as the Waxman-Markey bill, rely extensively on domestic land-use offsets, and that Canada could achieve real emissions reductions from these sectors, we qualitatively assess this issue in the report.

7.4 ASSESSMENT OF EMISSIONS-INTENSIVE AND TRADE-EXPOSED SECTORS

This Appendix shows the assessment of key sectors in terms of meeting the criteria established in Waxman-Markey for being emissions-intensive and trade-exposed.

Emissions-intensive sectors are those sectors that have an emissions intensity (defined as $20 X total emissions / value of shipments) greater or equal to 5%. Energy-intensive sectors are those that have an energy intensity (defined as costs of fuel purchase / the value of shipments) equal or greater to 5%. Trade-exposed sectors are those sectors with a trade intensity (defined as (total value of exports and imports) / (total value of turnover and imports) of greater than 15%. **Table D1** shows how different key sectors and sub-sectors meet or do not meet these criteria.

75 Calibrated CGE models operate from a single year input-output matrix, where all inputs and outputs are balanced. Estimated CGE modes operate using parameters estimated from historical time series.

TABLE D1 EMISSIONS-INTENSITY AND TRADE-EXPOSURE OF KEY CANADIAN SECTORS[76]

SECTOR	SUB-SECTOR	ENERGY OR EMISSIONS INTENSIVE?	TRADE EXPOSED?	INTENSIVE AND TRADE EXPOSED?	% OF CANADIAN GDP
OIL AND GAS EXTRACTION		YES	YES	YES	3%
MINING		YES	YES	YES	1%
ELECTRIC POWER GENERATION		YES	NO	NO	2%
PULP AND PAPER	SAWMILLS AND WOOD PRESERVATION	NO	YES	NO	2%
	VENEER, PLYWOOD AND WOOD PRODUCT MANUFACTURING	NO	YES	NO	
	OTHER WOOD PRODUCT MANUFACTURING	NO	YES	NO	
	PULP, PAPER AND PAPERBOARD MILLS	YES	YES	YES	
	CONVERTED PAPER PRODUCT MANUFACTURING	NO	YES	NO	
PETROLEUM AND COAL PRODUCTS MANUFACTURING		NO	YES	NO	0%
CHEMICAL MANUFACTURING	BASIC CHEMICAL MANUFACTURING	YES	YES	YES	1%
	RESIN, SYNTHETIC RUBBER, FIBRES MANUFACTURING	YES	YES	YES	
	AGRICULTURAL CHEMICAL MANUFACTURING	YES	YES	YES	
	PHARMACEUTICAL AND MEDICINE MANUFACTURING	NO	YES	NO	
	OTHER CHEMICAL PRODUCT MANUFACTURING	NO	YES	NO	
	PAINT, COATING AND ADHESIVE MANUFACTURING	YES	YES	YES	
	SOAP, CLEANING COMPOUND AND TOILET PREPARATION MANUFACTURING	YES	YES	YES	
INDUSTRIAL MINERALS	CEMENT AND CONCRETE PRODUCT MANUFACTURING	YES	YES	YES	1%
	OTHER NON-METALLIC MINERAL PRODUCT MANUFACTURING	NO	YES	NO	
IRON, STEEL AND ALUMINUM	IRON AND STEEL MILLS AND FERRO-ALLOY MANUFACTURING	YES	YES	YES	2%
	STEEL PRODUCT MANUFACTURING FROM PURCHASED STEEL	NO	YES	NO	
	ALUMINUM PRODUCTION AND PROCESSING	YES	YES	YES	
	NON-FERROUS METAL (EXCEPT ALUMINUM)	YES	YES	YES	
	FOUNDRIES	NO	NO	NO	

Adapted from: M. Bramley, P.J. Partington, & D. Sawyer. (2009).

76 Other sectors not shown here include services and light manufacturing sectors which have low emissions and energy intensity.

TABLE E1 SUMMARY OF DETAILED NATIONAL IMPACTS IN 2020 FOR MAIN SCENARIOS

	SCENARIO	VARIATIONS	POLICY IN CANADA				POLICY IN UNITED STATES			
			STRINGENCY	ALLOCATIONS / RECYCLING	COST CONTAINMENT	OTHER	STRINGENCY	ALLOCATIONS / RECYCLING	COST CONTAINMENT	OTHER
SCENARIOS TO EXPLORE KEY TIMING AND HARMONIZATION RISKS FOR CANADA	CANADA LEADS THE U.S.	CANADA LEADS, WITH NO U.S. ACTION BY 2020	17% BELOW 2005 BY 2020 CARBON PRICE OF $74/TONNE CO_2e	OUTPUT-BASED ALLOCATIONS FOR INDUSTRY, REVENUE RECYCLING TO CORPORATE AND INCOME TAXES (50% EACH) FOR REST OF ECONOMY	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $25/TONNE WITH NO U.S. ACTION)		NO CAP CARBON PRICE OF $0/ TONNE CO_2e	NA	NA	
	CANADA LAGS THE U.S	CANADA LAGS U.S. POLICY	NO CAP CARBON PRICE OF $0/TONNE CO_2e	NA	NA		17% BELOW 2005 BY 2020 CARBON PRICE OF $52/TONNE CO_2e	OUTPUT-BASED ALLOCATIONS FOR INDUSTRY, REVENUE RECYCLING TO CORPORATE AND INCOME TAXES (50% EACH) FOR REST OF ECONOMY	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE CO_2e WITH U.S. ACTION)	
		CANADA LAGS AND U.S IMPLEMENTS BCAs	NO CAP CARBON PRICE OF $0/TONNE CO_2e	NA	NA		17% BELOW 2005 BY 2020 CARBON PRICE OF $51/TONNE CO_2e	OUTPUT-BASED ALLOCATIONS FOR INDUSTRY, REVENUE RECYCLING TO CORPORATE AND INCOME TAXES (50% EACH) FOR REST OF ECONOMY	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE CO_2e WITH U.S. ACTION)	U.S. IMPLEMENTS BORDER ADJUSTMENTS ON ALL IMPORTS FROM ALL SECTORS AT CARBON PRICES EQUIVALENT TO THE U.S. PRICE
	CANADA HARMONIZES WITH THE U.S.	CANADA HARMONIZES WITH THE U.S. ON PRICE	8% BELOW 2005 BY 2020 CARBON PRICE OF $54 / TONNE CO_2e	OUTPUT-BASED ALLOCATIONS FOR INDUSTRY, REVENUE RECYCLING TO CORPORATE AND INCOME TAXES (50% EACH) FOR REST OF ECONOMY	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE WITH U.S. ACTION)		17% BELOW 2005 BY 2020 CARBON PRICE OF $54/TONNE CO_2e	OUTPUT-BASED ALLOCATIONS FOR INDUSTRY, REVENUE RECYCLING TO CORPORATE AND INCOME TAXES (50% EACH) FOR REST OF ECONOMY	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE CO_2e WITH U.S. ACTION)	
		CANADA HARMONIZES WITH THE U.S. ON TARGETS	17% BELOW 2005 BY 2020 CARBON PRICE OF $78/TONNE CO_2e	OUTPUT-BASED ALLOCATIONS FOR INDUSTRY, REVENUE RECYCLING TO CORPORATE AND INCOME TAXES (50% EACH) FOR REST OF ECONOMY	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE WITH U.S. ACTION)		17% BELOW 2005 BY 2020 CARBON PRICE OF $51/TONNE CO_2e	OUTPUT-BASED ALLOCATIONS FOR INDUSTRY, REVENUE RECYCLING TO CORPORATE AND INCOME TAXES (50% EACH) FOR REST OF ECONOMY	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE CO_2e WITH U.S. ACTION)	
SCENARIOS TO EXPLORE RISK MANAGEMENT OPPORTUNITIES FOR CANADA	LINKAGE		17% BELOW 2005 BY 2020 CARBON PRICE OF $60/TONNE CO_2e	OUTPUT-BASED ALLOCATIONS FOR INDUSTRY, REVENUE RECYCLING TO CORPORATE AND INCOME TAXES (50% EACH) FOR REST OF ECONOMY	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE WITH U.S. ACTION)	U.S. PERMITS ACCEPTED FOR COMPLIANCE IN CANADA	17% BELOW 2005 BY 2020 CARBON PRICE OF $60/TONNE CO_2e	OUTPUT-BASED ALLOCATIONS FOR INDUSTRY, REVENUE RECYCLING TO CORPORATE AND INCOME TAXES (50% EACH) FOR REST OF ECONOMY	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE CO_2e WITH U.S. ACTION)	CANADIAN PERMITS ACCEPTED IN U.S. U.S. PERMITS ACCEPTED IN CANADA
	PRICE ALIGNMENT SCENARIOS	NO COST CONTAINMENT	17% BELOW 2005 BY 2020 CARBON PRICE OF $79/TONNE CO_2e	OUTPUT-BASED ALLOCATIONS FOR INDUSTRY, REVENUE RECYCLING TO CORPORATE AND INCOME TAXES (50% EACH) FOR REST OF ECONOMY	NONE		17% BELOW 2005 BY 2020 CARBON PRICE OF $74/TONNE CO_2e	OUTPUT-BASED ALLOCATIONS FOR INDUSTRY, REVENUE RECYCLING TO CORPORATE AND INCOME TAXES (50% EACH) FOR REST OF ECONOMY	NONE	
		COST CONTAINMENT: SAFETY VALVE	8% BELOW 2005 BY 2020 SET BY SAFETY VALVE COST CONTAINMENT CARBON PRICE OF $54/TONNE CO_2e	OUTPUT-BASED ALLOCATIONS FOR INDUSTRY, REVENUE RECYCLING TO CORPORATE AND INCOME TAXES (50% EACH) FOR REST OF ECONOMY	UNLIMITED SAFETY VALVE SETS A MAXIMUM CANADIAN CARBON PRICE EQUAL TO THE U.S. CARBON PRICE, GOVERNMENT REVENUE FROM THE SAFETY VALVE IS RECYCLED TO CORPORATE AND INCOME TAXES (50% EACH; MAXIMUM OF 20% COMPLIANCE TROUGH INTERNATIONAL PERMITS)		17% BELOW 2005 BY 2020 CARBON PRICE OF $54/TONNE CO_2e	OUTPUT-BASED ALLOCATIONS FOR INDUSTRY, REVENUE RECYCLING TO CORPORATE AND INCOME TAXES (50% EACH) FOR REST OF ECONOMY	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE CO_2e WITH U.S. ACTION)	

	SCENARIO	VARIATIONS	POLICY IN CANADA				POLICY IN UNITED STATES			
			STRINGENCY	ALLOCATIONS / RECYCLING	COST CONTAINMENT	OTHER	STRINGENCY	ALLOCATIONS / RECYCLING	COST CONTAINMENT	OTHER
SCENARIOS TO EXPLORE RISK MANAGEMENT OPPORTUNITIES FOR CANADA	PERMIT ALLOCATIONS AND REVENUE RECYCLING	FREE OUTPUT-BASED ALLOCATIONS BASED ON VALUE-ADDED	17% BELOW 2005 BY 2020 CARBON PRICE OF $78/TONNE CO_2e	FREE OUTPUT BASED ALLOCATIONS TO INDUSTRY BASED ON VALUE-ADDED BENCHMARK	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE WITH U.S. ACTION)		17% BELOW 2005 BY 2020 CARBON PRICE OF $54/TONNE CO_2e	FREE OUTPUT-BASED ALLOCATIONS TO INDUSTRY BASED ON VALUE-ADDED BENCHMARK	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE WITH U.S. ACTION)	
		FREE OUTPUT-BASED ALLOCATIONS BASED ON EMISSIONS-INTENSITY	17% BELOW 2005 BY 2020 CARBON PRICE OF $116/TONNE CO_2e	FREE OUTPUT-BASED ALLOCATIONS TO INDUSTRY BASED ON EMISSIONS-INTENSITY BENCHMARK	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE WITH U.S. ACTION)		17% BELOW 2005 BY 2020 CARBON PRICE OF $66/TONNE CO_2e	FREE OUTPUT-BASED ALLOCATIONS TO INDUSTRY BASED ON EMISSIONS-INTENSITY BENCHMARK	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE WITH U.S. ACTION)	
		AUCTION WITH RECYCLING MOSTLY TO INCOME TAX	17% BELOW 2005 BY 2020 CARBON PRICE OF $77/TONNE CO_2e	FULL AUCTION WITH REVENUE RECYCLING (75% TO INCOME TAX, 25% TO CORPORATE)	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE WITH U.S. ACTION)		17% BELOW 2005 BY 2020 CARBON PRICE OF $54/TONNE CO_2e	FULL AUCTION WITH REVENUE RECYCLING (75% TO INCOME TAX, 25% TO CORPORATE)	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE WITH U.S. ACTION)	
		AUCTION WITH RECYCLING TO BOTH INCOME AND CORPORATE TAX	17% BELOW 2005 BY 2020 CARBON PRICE OF $54/TONNE CO_2e	FULL AUCTION WITH REVENUE RECYCLING (50% TO INCOME TAX, 50% TO CORPORATE)	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE WITH U.S. ACTION)		17% BELOW 2005 BY 2020 CARBON PRICE OF $53/TONNE CO_2e	FULL AUCTION WITH REVENUE RECYCLING (50% TO INCOME TAX, 50% TO CORPORATE)	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE WITH U.S. ACTION)	
		AUCTION WITH RECYCLING MOSTLY TO CORPORATE TAX	17% BELOW 2005 BY 2020 CARBON PRICE OF $77/TONNE CO_2e	FULL AUCTION WITH REVENUE RECYCLING (25% TO INCOME TAX, 75% TO CORPORATE)	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE WITH U.S. ACTION)		17% BELOW 2005 BY 2020 CARBON PRICE OF $52/TONNE CO_2e	FULL ACTION WITH REVENUE RECYCLING (25% TO INCOME TAX, 75% TO CORPORATE)	MAXIMUM OF 20% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS (PRICE OF INTERNATIONAL PERMITS IS ASSUMED TO BE $50/TONNE WITH U.S. ACTION)	
SCENARIOS TO EXPLORE A TRANSITIONAL POLICY OPTION FOR CANADA	TRANSITIONAL POLICY OPTION IF THE U.S. IMPLEMENTS NO NATIONAL POLICY		17% BELOW 2005 BY 2020 CARBON PRICE OF $30/TONNE CO_2e	OUTPUT-BASED ALLOCATIONS FOR INDUSTRY, REVENUE RECYCLING TO CORPORATE AND INCOME TAXES (50% EACH) FOR REST OF ECONOMY	MAXIMUM OF 25% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS ($25/TONNE WITH NO U.S. ACTION) SAFETY VALVE TO SET MAXIMUM CANADIAN CARBON PRICE AT $30 ABOVE U.S. CARBON PRICE ($0 + 30 = $30)		NO CAP CARBON PRICE OF $0/TONNE CO_2e	NA	NA	
	TRANSITIONAL POLICY OPTION IF THE U.S. IMPLEMENTS WAXMAN-MARKEY-STYLE POLICY		17% BELOW 2005 BY 2020 CARBON PRICE OF $63/TONNE CO_2e	OUTPUT-BASED ALLOCATIONS FOR INDUSTRY, REVENUE RECYCLING TO CORPORATE AND INCOME TAXES (50% EACH) FOR REST OF ECONOMY	MAXIMUM OF 25% OF COMPLIANCE THROUGH INTERNATIONAL PERMITS ($50/TONNE WITH NO U.S. ACTION) SAFETY VALVE TO SET MAXIMUM CANADIAN CARBON PRICE AT $30 ABOVE U.S. CARBON PRICE ($33 + 30 = $63)		17% BELOW 2005 BY 2020 CARBON PRICE OF $33/TONNE CO_2e	OUTPUT-BASED ALLOCATIONS FOR INDUSTRY, REVENUE RECYCLING TO CORPORATE AND INCOME TAXES (50% EACH) FOR REST OF ECONOMY	EXTENSIVE DOMESTIC AND INTERNATIONAL PERMITS	

TABLE F1 REGIONAL GDP GROWTH RATES TO 2020 AND GDP IMPACTS (PERCENT DIFFERENCE IN FORECASTED GDP IN 2020 RELATIVE TO REFERENCE CASE)

		AVERAGE ANNUAL GROWTH RATES							GDP IMPACT IN 2020 RELATIVE TO REFERENCE CASE						
		BC	AB	SK	MB	ON	QC	AT	BC	AB	SK	MB	ON	QC	AT
CANADA LEADS THE U.S.	CANADA LEADS, WITH NO U.S. ACTION BY 2020	2.1%	1.8%	2.1%	2.0%	2.2%	1.8%	1.5%	-2.5%	-4.5%	-2.8%	-1.0%	-1.2%	-1.4%	-2.3%
CANADA LAGS THE U.S.	NO POLICY IN CANADA, U.S. ACHIEVES TARGETS	2.3%	2.1%	2.2%	2.1%	2.2%	1.8%	1.7%	-0.4%	0.0%	-0.2%	0.3%	-0.3%	-0.1%	-0.2%
	NO POLICY IN CANADA, U.S. ACHIEVES TARGETS AND IMPLEMENTS BCAs	2.3%	2.1%	2.2%	2.1%	2.2%	1.8%	1.7%	-0.4%	-0.1%	-0.3%	0.1%	-0.3%	-0.1%	-0.1%
CANADA HARMONIZES WITH THE U.S.	CANADA HARMONIZES WITH THE U.S. ON PRICE	2.1%	1.8%	2.1%	2.0%	2.2%	1.8%	1.6%	-2.6%	-3.3%	-2.2%	-1.0%	-1.0%	-1.4%	-1.6%
	CANADA HARMONIZES WITH THE U.S. ON TARGETS	2.1%	1.7%	2.0%	2.0%	2.2%	1.7%	1.5%	-3.3%	-4.7%	-3.1%	-1.3%	-1.5%	-1.7%	-2.7%
LINKAGE	CANADA AND THE U.S. IN A LINKED CAP-AND-TRADE SYSTEM WITH COMMON TARGETS	2.1%	1.8%	2.1%	2.0%	2.2%	1.7%	1.6%	-2.9%	-3.7%	-2.5%	-1.2%	-1.3%	-1.5%	-1.8%
PRICE ALIGNMENT SCENARIO	NO COST CONTAINMENT	2.1%	1.8%	2.1%	2.0%	2.2%	1.8%	1.5%	-3.1%	-4.6%	-2.9%	-1.1%	-1.3%	-1.4%	-2.4%
	CANADA USES A SAFETY VALVE TO ALIGN CARBON PRICES WITH THE U.S.	2.1%	1.8%	2.1%	2.0%	2.2%	1.8%	1.6%	-2.6%	-3.3%	-2.2%	-1.0%	-1.0%	-1.4%	-1.6%
PERMIT ALLOCATIONS	FREE OUTPUT-BASED ALLOCATIONS ON VALUE-ADDED BENCHMARK	2.1%	1.7%	2.0%	2.0%	2.2%	1.7%	1.5%	-3.3%	-4.7%	-3.1%	-1.3%	-1.5%	-1.7%	-2.7%
	FREE OUTPUT-BASED ALLOCATIONS ON EMISSIONS INTENSITY BENCHMARK	2.1%	2.0%	2.3%	2.0%	2.1%	1.7%	1.6%	-3.0%	-1.6%	0.0%	-2.3%	-2.6%	-2.5%	-1.5%
	AUCTION WITH RECYCLING MOSTLY TO INCOME TAX	2.1%	1.8%	2.1%	2.1%	2.2%	1.8%	1.5%	-3.0%	-4.2%	-2.4%	-0.8%	-1.2%	-1.3%	-2.3%
	AUCTION WITH RECYCLING TO BOTH INCOME AND CORPORATE TAXES	2.1%	1.8%	2.1%	2.1%	2.2%	1.8%	1.5%	-3.0%	-4.0%	-1.9%	-0.6%	-1.2%	-1.3%	-2.3%
	AUCTION WITH RECYCLING MOSTLY TO CORPORATE TAX	2.1%	1.8%	2.2%	2.1%	2.2%	1.8%	1.5%	-3.1%	-3.7%	-1.5%	-0.3%	-1.2%	-1.3%	-2.3%
TRANSITIONAL POLICY OPTION FOR CANADA	TRANSITIONAL POLICY OPTION IF THE U.S. IMPLEMENTS NO NATIONAL POLICY	2.2%	2.0%	2.2%	2.1%	2.2%	1.8%	1.6%	-1.2%	-1.7%	-1.4%	-0.5%	-0.4%	-0.8%	-0.8%
	TRANSITIONAL POLICY OPTION IF THE U.S. IMPLEMENTS WAXMAN-MARKEY-STYLE POLICY	2.2%	1.9%	2.2%	2.2%	2.2%	1.8%	1.6%	-1.8%	-2.8%	-0.3%	1.0%	-0.7%	-0.6%	-1.2%
REFERENCE CASE		2.3%	2.1%	2.3%	2.1%	2.3%	1.8%	1.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

TABLE F2 SUMMARY OF DETAIILED NATIONAL IMPACTS IN 2020 FOR MAIN SCENARIOS

SCENARIO		GHG PRICE ($/tCO$_2$e)		DOMESTIC EMISSIONS (Mt) RELATIVE TO 2005		DOMESTIC EMISSIONS (Mt) RELATIVE TO REFERENCE CASE IN 2020		CROSS BORDER PERMIT PURCHASES (MILLIONS)		AVERAGE ANNUAL GROWTH RATE TO 2020 (%)		% CHANGE IN GDP IN 2020 RELATIVE TO REFERENCE CASE (BASIC PRICES)		NET CHANGE IN CAPITAL EMPLACE-MENT ($) BILLIONS		NET CHANGE IN CAPITAL EMPLACE-MENT (%)		WELFARE (EQUIVALENT VARIATION, %)		INCREASE IN NET EXPORTS ($ BILLIONS)	
		CAN	USA	CAN	USA	CAN	USA	CAN	USA	CAN	USA	CAN	USA	CAN	USA	CAN	USA	CAN	USA	CAN	USA
CANADA LEADS THE U.S.	CANADA LEADS, WITH NO U.S. ACTION BY 2020	74	0	-14%	1%	-22%	0%	-	-	1.9%	2.3%	-2.0%	0.0%	-5.9	5.6	-1.3%	0.1%	-0.5%	0.0%	-5.3	2.1
CANADA LAGS THE U.S.	NO POLICY IN CANADA, U.S. ACHIEVES TARGETS	0	52	10%	-14%	0%	-15%	-	-	2.0%	2.2%	-0.2%	-0.6%	0.6	-0.6	0.1%	0.0%	-0.4%	-0.2%	6.0	1.0
	NO POLICY IN CANADA, U.S. ACHIEVES TARGETS AND IMPLEMENTS BCAs	0	51	10%	-14%	0%	-15%	-	-	2.0%	2.3%	-0.2%	-0.7%	0.2	-0.2	0.1%	0.0%	-0.4%	-0.3%	5.7	2.3
CANADA HARMONIZES WITH THE U.S.	CANADA HARMONIZES WITH THE U.S. ON PRICE	54	54	-8%	-14%	-16%	-15%	-	-	1.9%	2.3%	-1.6%	-0.6%	-4.0	4.0	-0.9%	0.1%	-0.7%	-0.2%	2.0	3.3
	CANADA HARMONIZES WITH THE U.S. ON TARGETS	78	54	-14%	-14%	-22%	-15%	-	-	1.9%	2.3%	-2.3%	-0.6%	-5.6	5.5	-1.3%	0.1%	-1.0%	-0.2%	0.5	4.1
LINKAGE	CANADA AND THE U.S. IN A LINKED CAP-AND-TRADE SYSTEM WITH COMMON TARGETS	60	60	-9%	-15%	-17%	-16%	$2,097	$-2,097	1.9%	2.3%	-1.9%	-0.7%	-5.7	5.7	-1.3%	0.1%	-0.9%	-0.2%	2.4	1.8
PRICE ALIGNMENT SCENARIO	NO COST CONTAINMENT	79	74	-17%	-17%	-25%	-18%	-	-	1.9%	2.2%	-2.1%	-0.9%	-3.1	3.1	-0.7%	0.0%	-0.7%	-0.2%	-3.0	-0.9
	CANADA USES A SAFETY VALVE TO ALIGN CARBON PRICES WITH THE U.S.	54	54	-8%	-14%	-16%	-15%	-	-	1.9%	2.3%	-1.6%	-0.6%	-4.0	4.0	-0.9%	0.1%	-0.7%	-0.2%	2.0	3.3
PERMIT ALLOCATIONS	FREE OUTPUT-BASED ALLOCATIONS ON VALUE-ADDED BENCHMARK	78	54	-14%	-14%	-22%	-15%	-	-	1.9%	2.3%	-2.3%	-0.6%	-5.6	5.5	-1.3%	0.1%	-1.0%	-0.2%	0.5	4.1
	FREE OUTPUT-BASED ALLOCATIONS ON EMISSIONS INTENSITY BENCHMARK	116	66	-14%	-14%	-22%	-15%	-	-	1.9%	2.2%	-2.3%	-0.6%	-2.5	2.4	-0.6%	0.0%	-0.9%	-0.1%	3.4	22.5
	AUCTION WITH RECYCLING MOSTLY TO INCOME TAX	77	54	-14%	-14%	-22%	-15%	-	-	1.9%	2.3%	-1.9%	-0.6%	-2.2	2.2	-0.5%	0.0%	-0.9%	-0.2%	3.9	-0.6
	AUCTION WITH RECYCLING TO BOTH INCOME AND CORPORATE TAXES	77	53	-14%	-14%	-22%	-15%	-	-	1.9%	2.3%	-1.7%	-0.7%	0.6	-0.7	0.1%	0.0%	-0.9%	-0.2%	6.7	-3.1
	AUCTION WITH RECYCLING MOSTLY TO CORPORATE TAX	76	52	-14%	-14%	-22%	-15%	-	-	2.0%	2.3%	-1.6%	-0.9%	3.5	-3.5	0.8%	-0.1%	-0.8%	-0.1%	9.7	-5.6
TRANSITIONAL POLICY OPTION FOR CANADA	TRANSITIONAL POLICY OPTION IF THE U.S. IMPLEMENTS NO NATIONAL POLICY	30	0	-3%	1%	-12%	0%	-	-	2.0%	2.3%	-0.3%	0.0%	1.4	-1.4	0.3%	0.0%	-0.2%	0.0%	1.8	-6.1
	TRANSITIONAL POLICY OPTION IF THE U.S. IMPLEMENTS WAXMAN-MARKEY-STYLE POLICY	63	33	-10%	-11%	-18%	-12%	-	-	2.0%	2.3%	-0.9%	-0.3%	2.1	-2.1	0.5%	0.0%	-0.6%	0.0%	8.4	-10.2

7.7 STAKEHOLDER ENGAGEMENT

ADVISORY COMMITTEE

Meetings of the Canada-U.S. climate policy study advisory committee took place in Ottawa in July and November 2009 and April 2010; and in Calgary in April 2010. Note that some participants' organizations may have changed during that time.

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TransAlta Professor of Environmental Management and Sustainability
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John Dillon
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Carleton University

Carl Sonnen
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Informetrica Limited

Don Wharton
Vice-President
Sustainable Development Planning
TransAlta

Tony Young
Director General of Economic Analysis
Strategic Policy Branch
Environment Canada

WASHINGTON STAKEHOLDER SESSION – MEETING PARTICIPANTS

In January 2010, the NRTEE, in partnership with the Woodrow Wilson Center for International Scholars in Washington, D.C., hosted a meeting of U.S. and Canadian climate policy experts to review and discuss analysis and findings of the NRTEE's climate policy study. Participants were as follows:

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TransAlta Professor of Environmental Management and Sustainability
University of Calgary

Dale Beugin
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Meera Fickling
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Peterson Institute for International Economics

Paul Frazer
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Three Click Solutions

David Herman
Office of Canadian Affairs
U.S. Department of State

Dina Kruger
Director, Climate Change Division
U.S. Environmental Protection Agency

Marc Lepage
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National Governors Association

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TECHNICAL PEER REVIEW

At various stages of research and analysis, climate policy experts provided technical peer review to ensure our findings were credible and rigorous. The reviewers were as follows:

Carolyn Fischer
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Andrew Leach
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Colin Robertson
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Carl Sonnen
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7.8 REFERENCES

American Clean Energy and Security Act of 2009, H.R. 2454, 111th Congress, 1st Session (2009). Retrieved from http://frwebgate.access.gpo.gov/cgibin/getdoc.cgi?dbname=111_cong_bills&docid=f:h2454eh.txt.pdf

Baylor, M. & Beauséjour, L. (2004). *Taxation and Economic Efficiency: Results from a Canadian CGE Model*. Working Paper 2004-10. Ottawa, ON: Finance Canada. Retrieved from http://dsp-psd.pwgsc.gc.ca/collection_2009/fin/F21-8-2004-10E.pdf

Boyland, M. (2006). The economics of using forests to increase carbon storage. *Canadian Journal of Forest Research*, 36(9), 2223-2234. Ottawa, ON: NCR Research Press.

Bramley, M., Partington, P.J., & Sawyer, D. (2009). *Linking National Cap-and-Trade Systems in North America*. IISD and Pembina Institute. Retrieved from http://www.iisd.org/pdf/2009/linking_nat_cap_north_america.pdf

Canadian Association of Petroleum Producers (CAPP) (2010). Crude Oil Forecast, Markets & Pipelines. Calgary, AB: CAPP. Retrieved from http://www.capp.ca/getdoc.aspx?Docld=173003

Clapp, C., Karousakis, K., Buchner, B., & Chateau, J. (2009). National and Sectoral GHG Mitigation Potential: A Comparison Across Models. Paris, France: Oganisation for Economic Co-operation and Development (OECD) and International Energy Agency (IEA). Retrieved from http://www.oecd.org/dataoecd/42/33/44050733.pdf

Clark, C., & Milner, B. (2010, May 28). Mexico's President pushes Ottawa to act on climate change. *The Globe and Mail*. Retrieved from http://www.theglobeandmail.com/news/politics/mexicos-president-pushes-ottawa-to-act-on-climate-change/article1583574/

Clean Energy Jobs and American Power Act of 2009, S. 1733 111th Congress, 1st Session (2009). Retrieved from http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=111_cong_bills&docid=f:s1733is.txt.pdf

Commission on Climate and Tropical Forests (2009). *Protecting the Climate Forests*. Commission on Climate and Tropical Forests. Retrieved from: http://www.climateforestscommission.org/documents/cctf-report.pdf

Congressional Budget Office (2010). *Discussion Draft of the American Power Act* [Letter to the Honorable John F. Kerry, July 7, 2010]. Washington, DC: U.S. Congress. Retrieved from http://www.cbo.gov/ftpdocs/115xx/doc11565/AmericanPowerActKerryLtr.pdf

Congressional Budget Office (2009). *The Use of Offsets to Reduce Greenhouse Gases*. Economic and Issue Brief. Retrieved from http://www.cbo.gov/ftpdocs/104xx/doc10497/08-03-Offsets.pdf

Congressional Budget Office (2009). *The Estimated Costs to Households from the Cap-and-Trade Provisions of H.R. 2454*. Washington, DC: U.S. Congress. Retrieved from http://www.cbo.gov/ftpdocs/103xx/doc10327/06-19-CapAndTradeCosts.pdf

Dissou, Y., and Eyland, T. (2009). *Pollution Control, Competitiveness, and Border Tax Adjustment, Department of Economics* (Working Paper #0908E). Ottawa, ON: University of Ottawa.

Dissou, Y. (2006). Efficiency and Sectoral Distributional Impacts of Output-Based Emissions Allowances in Canada. *Contributions to Economic Analysis & Policy*, BE Press, 5, 1. Article 26.

Edmonton Journal (2010, June 23). Climate change technology fund awards $5.7 million. *Edmonton Journal*. Retrieved from: http://www.edmontonjournal.com/technology/Climate%20change%20technology%20fund%20awards%20million/3191667/story.html

Energy Information Administration (2009). *Annual Energy Outlook 2009 with projections to 2030*. Washington, D.C.: Energy Information Administration. Retrieved from: http://www.eia.doe.gov/oiaf/aeo/pdf/0383(2009).pdf

Environment Canada (2010, June). *Government of Canada to Regulate Emissions from Electricity Sector*. Retrieved from http://www.ec.gc.ca/default.asp?lang=En&n=714D9AAE-1&news=E5B59675-BE60-4759-8FC3-D3513EAA841C

Environment Canada (2010, April). *Regulating GHG Emissions from New Vehicles in Canada*. Retrieved July 27, 2010, from http://www.ec.gc.ca/default.asp?lang=En&n=714D9AAE-1&news=9CA6EB09-6F52-4C43B8F7-BFE401D6EB29)

Environment Canada (2010, February). *Speaking Points for The Honourable Jim Prentice, Minister of the Environment to the Members of the University of Calgary School of Public Policy and the School of Business Calgary, Alberta* [speech]. Retrieved from http://www.ec.gc.ca/default.asp?lang=En&n=6F2DE1CA-1&news=1E866FB5-273D-46F2-9ED8-5CFFBCE8E069

Environment Canada (2010, February). *Canada Lists Emissions Target under the Copenhagen Accord* [news release]. Retrieved from http://www.ec.gc.ca/default.asp?lang=En&n=714D9AAE-1&news=EAF552A3-D287-4AC0-ACB8-A6FEA697ACD6

Environment Canada (2007). *A Climate Change Plan for the Purposes of the Kyoto Protocol Implementation Act 2007*. Gatineau, QC: Environment Canada. Retrieved from http://www.ec.gc.ca/doc/ed-es/p_123/CC_Plan_2007_e.pdf

Fisher, C., Sawyer, D. (2010). *Better Together? The Implications of Linking Canada – US Greenhouse Gas Policies*. Toronto, ON: C.D. Howe Institute. Retrieved from http://www.cdhowe.org/pdf/commentary_307.pdf

Fisher, C., and Fox, A. K. (2009). C*omparing Policies to Combat Emissions Leakage: Border Tax Adjustments versus Rebates*. Washington, DC: Resources For the Future (Discussion Paper 09-02). Retrieved from http://www.rff.org/rff/documents/RFF-DP-09-02.pdf

Fischer, C., and Fox, A. K. (2007). Output-Based Allocation of Emissions Permits for Mitigating Tax and Trade Interactions. Land Economics, 83(4), 575-599.

Graham, P. (2003). *Potential Options to Increase Sequestration through Incremental Forest Management Actions: Key Data and Research Needs for Analysis*. Ottawa, ON: Natural Resources Canada. Report commissioned by the National Forest Sinks Committee.

Houser, T., Bradley, R., Childs, B., Werksman, J., and Heilmayr, R. (2008). *Leveling the Carbon Playing Field International Competition and US Climate Policy Design*. Washington, DC.: Peterson Institute for International Economics. Retrieved from: http://pdf.wri.org/leveling_the_carbon_playing_field.pdf

Industry Canada (2009). *Trade Data Online*. Retrieved from: http://www.ic.gc.ca/eic/site/tdo-dcd.nsf/eng/Home

Integrated CO_2 Network Group of Companies (2009). *Carbon Dioxide Capture and Storage: A Canadian Clean Energy Opportunity*. Calgary, AB: ICO_2N. Retrieved from http://www.ico2n.com/wp-content/uploads/2010/07/ICO2N-Report_09_final2.pdf

International Energy Agency (2009). *Electricity / Heat by Country / Region*. Retrieved from: http://www.iea.org/stats/prodresult.asp?PRODUCT=Electricity/Heat

Jaffe, J., & Stavins, R. (2007). *Linking Tradable Permit Systems for Greenhouse Gas Emissions: Opportunities, Implications, and Challenges*. Analysis Group, Inc. Report commissioned by the International Emissions Trading Association. Retrieved from http://www.ieta.org/ieta/www/pages/getfile.php?docID=2733

Lazarowicz, M. (2009). *Global Carbon Trading A framework for reducing emissions*. Norwich, United Kingdom: The Stationery Office (TSO).

McKenney, D. W., Yemshanov, D., Fox, G., & Ramlal, E. (2004). Cost estimates for carbon sequestration from fast growing poplar plantations in Canada. *Forest Policy and Economics*, 6, 345-358.

McKinsey & Company (2009). *Pathways to a Low-carbon Economy: Version 2 of the Global Greenhouse Abatement Cost Curve*. McKinsey & Company. Retrieved from http://www.worldwildlife.org/climate/WWFBinaryitem11334.pdf

McFarland, J.R., Reilly, J. Herzog, H. (2004). Representing energy technologies in top-down economic models using bottom-up information. *Energy Economics*, 26, 685-707.

Morris J., Paltsev S., & Reilly J (2008). *Marginal Abatement Costs and Marginal Welfare Costs for Greenhouse Gas Emissions Reductions: Results from the EPPA Model* (Report No. 164). Cambridge, MA: MIT Joint Program on the Science and Policy of Global Change. Retrieved from http://globalchange.mit.edu/files/document/MITJPSPGC_Rpt164.pdf

National Energy Board (2007). *Canada's Energy Future – Reference Case and Scenarios to 2030 - Energy Market Assessment*. Calgary, AB: National Energy Board. Retrieved from: http://www.neb-one.gc.ca/clf-nsi/rnrgynfmtn/nrgyrprt/nrgyftr/2007/nrgyftr2007-eng.html

National Round Table on the Environment and the Economy (2009). *Achieving 2050: A Carbon Pricing Policy for Canada*. Ottawa, ON: Government of Canada.

National Round Table on the Environment and the Economy (2009a). *Achieving 2050: A Carbon Pricing Policy for Canada (Technical Report)*. Ottawa, ON: Government of Canada.

Natural Resources Canada (2009). *Forest Carbon Accounting: Frequently Asked Questions*. Retrieved July 27, 2010, from http://carbon.cfs.nrcan.gc.ca/FAQ_e.html#1a

Natural Resources Canada (2008). *Canada's Fossil Energy Future: The Way Forward on Carbon Capture and Storage*. Retrieved September 13, 2010, from http://www.nrcan-rncan.gc.ca/com/resoress/publications/fosfos/fosfos-eng.pdf?PHPSESSID=3071f17c7f24e90342b292089554358e

Parker, L., & Yacobucci, B.D. (2009). *Climate Change: Costs and Benefits of the Cap-and-Trade Provisions of H.R. 2454*. Congressional Research Service. Retrieved from http://energy.senate.gov/public/_files/R40809.pdf

RiskMetrics Group (2010). *Canada's Oil Sands: Shrinking Window of Opportunity*. Report commissioned by Ceres. Retrieved from http://www.ceres.org/Page.aspx?pid=1251

Sawyer, D., (2010). *Competitiveness*. Research and analysis prepared for the NRTEE.

Statistics Canada (2009, January). *Canada Year Book Overview 2008*. Retrieved from: http://www41.statcan.gc.ca/2008/ceb_r000_2008-eng.htm

Simonova, E. & Lefebvre, R. (2009). *Carbon Revenue Recycling – Opportunities and Challenges*. Ottawa, ON: Certified General Accountants Association of Canada. Retrieved from http://www.cga-canada.org/en-ca/ResearchReports/ca_rep_2009-09_carbon_revenue_recycling.pdf

Sue Wing, I. (2008). The Synthesis of Bottom-Up and Top-Down Approaches to Climate Policy Modeling: Electric Power Technology Detail in a Social Accounting Framework. *Energy Economics*, 30, 547-573. Retrieved from http://people.bu.edu/isw/papers/top-down_bottom-up_sam.pdf

U.S. Environmental Protection Agency (2010). *Carbon Sequestration in Agriculture and Forestry: National Mitigation Analysis*. Washington, DC: U.S. Environmental Protection Agency. Retrieved from http://www.epa.gov/sequestration/mitigation_national.html

U.S. Environmental Protection Agency, Office of Atmospheric Programs (2010). *EPA Analysis of the American Power Act in the 111th Congress*. Washington, DC: U.S. Environmental Protection Agency. Retrieved from http://www.epa.gov/climatechange/economics/pdfs/EPA_APA_Analysis_6-14-10.pdf

U.S. Environmental Protection Agency, Office of Atmospheric Programs (2009). *Economic Impacts of S. 1733: The Clean Energy Jobs and American Power Act of 2009*. Washington, DC: U.S. Environmental Protection Agency. Retrieved from http://www.epa.gov/climatechange/economics/pdfs/EPA_S1733_Analysis.pdf

U.S. Environmental Protection Agency, Office of Atmospheric Programs (2009). *EPA Preliminary Analysis of the Waxman-Markey Discussion Draft:The American Clean Energy and Security Act of 2009 in the 111th Congress*. Washington, DC: U.S. Environmental Protection Agency. Retrieved from http://www.epa.gov/climatechange/economics/pdfs/WM-Analysis.pdf

U.S. Environmental Protection Agency, Office of Atmospheric Programs (2005). *Greenhouse Gas Mitigation Potential in U.S. Forestry and Agriculture* (Report No. EPA 430-R-05-006). Washington, DC: U.S. Environmental Protection Agency. Retrieved from http://www.epa.gov/sequestration/pdf/greenhousegas2005.pdf

Yemshanov, D., McKenney, D. W., Hatton, T., & Fox, G. (2005). Investment Attractiveness of Afforestation in Canada Inclusive of Carbon Sequestration Benefits. *Canadian Journal of Agricultural Economics*, 53, 307-323.

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CLIMATE PROSPERITY

THE TIMELINE

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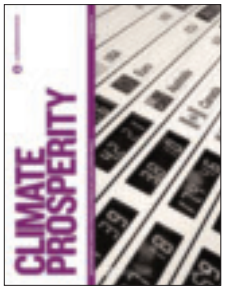

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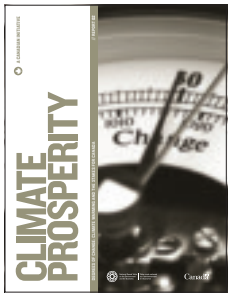

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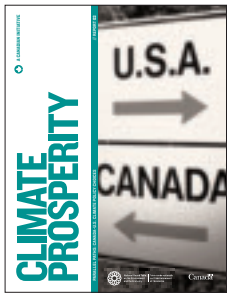

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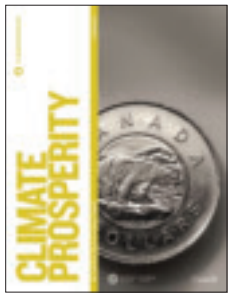
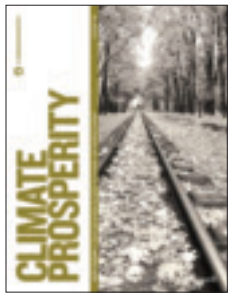


REPORT 04 //
NET NATIONAL COSTS OF CLIMATE CHANGE

This report will provide, for the first time, national economic costings of the impact of climate change on Canada, together with a detailed look at four key sectors: coastal zones, human health, public infrastructure and forests.

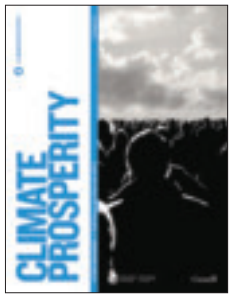
REPORT 05 //
POLICY PATHWAY REPORT FOR CLIMATE IMPACTS AND ADAPTATION

Building on previous reports in the series, this advisory report will provide a range of policy pathways and actions to help Canada take advantage of its potential to adapt to a changing climate.



REPORT 06 //
POLICY PATHWAY REPORT FOR GLOBAL LOW-CARBON TRANSITION

Building on previous reports in the series, this advisory report will provide policy pathways and actions necessary for Canada to thrive in a global low-carbon economy in areas such as energy, innovation, skills, investment and governance.



REPORT 07 //
CITIZEN ENGAGEMENT

This report will highlight input from Canadian citizens sought during the course of the program to ensure action on climate change is underpinned by abroad social consensus informed by democratic dialogue and debate.

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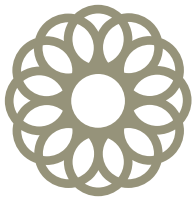
A CANADIAN INITIATIVE



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