NATIONAL CLIMATE CHANGE PROCESS

INDUSTRY TABLE

OVERVIEW REPORT

February, 2000

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EXECUTIVE SUMMARY[1]

Climate change is a global and long-term issue that can only be addressed by the countries of the world acting together in a way that recognizes their strengths and capabilities. Canada must be a player in this global response, but we must ensure that the national strategy which we design over the next decade will support and enhance the economic fortunes of the country and the aspirations of individual Canadians for an improved standard of living. We need to fully assess Canada's strengths and vulnerabilities vis-à-vis climate change and devise a set of strategies that build on the country's comparative advantages. A longer-term strategy will allow adequate time for adjustment and ensure that we take advantage of new, lower emission technologies. But we also can start now to test innovative strategies and begin to put the essential building blocks in place. And we must broaden Canadians' understanding of the issue and their own contribution to the problem, for only then can we have a national strategy that will stand the test of time.

Canadian industry is fully committed to playing a constructive role in developing Canada's national greenhouse gas strategy. The Industry Table believes it is fundamental to understand the environmental, economic and social implications of Canada's Kyoto commitment before deciding on a national strategy and before any judgment is made on ratification of the Kyoto Protocol. The current national process has been extremely valuable in building that understanding, and ongoing stakeholder engagement is essential as we move forward.

The mandate of the Industry Table was to develop a broader understanding of the challenges and opportunities facing industry in responding to climate change, and to evaluate a range of options for reducing greenhouse gas emissions in the context of the National Implementation Strategy (NIS). Further, the Table sought to recommend solutions that will contribute to the competitiveness of Canadian industry and result in no undue burden upon any region or sector. The Table developed a set of principles to guide the selection of appropriate options and used a competitiveness framework to help in assessing likely impacts.

The main analytical work was conducted through a series of seven sub-tables – upstream oil and gas, petroleum refining, chemicals, minerals and metals, transportation equipment manufacturing, "other" manufacturing, and small and medium enterprises. This was viewed as the most effective way to examine the technical opportunities for GHG reduction in industrial sectors, and to consider the specific implications of implementing Kyoto on those sectors. This comprehensive examination represents a substantial but nonetheless preliminary step in the overall analysis of Canada's national strategy. Time did not allow for a thorough analysis of the implications which actions in one sector could have on other related sectors in the supply chain, nor was there sufficient opportunity to probe how measures recommended by other tables in the process could affect the major industry sectors. Nonetheless, our work identified a number of promising opportunities and the information and insight developed will serve the country well whatever our eventual long-term response to climate change.

The Industry Table believes that there are certain realities that frame Canada's overall response:

1. **First and foremost is the sheer magnitude of the challenge which Canada's Kyoto target represents.** Current estimates suggest the gap between our forecasted emissions for the Kyoto commitment period and the Kyoto target is 199 megatonnnes, or some 26 percent. To illustrate the size of the challenge, this 199 Mt gap is only slightly smaller than the total current emissions from all the sectors which make up the Industry Table. It is fundamental to recognize that GHG emissions are primarily a consumption issue – industry broadly defined contributes only 33 percent of national emissions – and thus all Canadians would be affected. The necessary transformation of our economic, transportation and urban infrastructure would be significant and the target implies energy efficiency gains and other important changes throughout Canadian society of unprecedented proportion.

[1] Two members submitted a minority opinion in response to the Executive Summary. See Appendix A.

2. **Against this reality, industry has been responding to the need to address emissions**. The sub-table reports document the significant strides which a number of industry sectors have made in reducing the emissions intensity of their production. However, for the most part these gains have been overtaken by the overall growth in industrial output. In addition, there is the complicating factor that in some cases actions to address other environmental issues will require more energy not less. Industry will be driven by competitive realities to increase yields and improve the efficiency of production, including better use of energy. However, many sectors already are at or near world-class performance[2] and it is not obvious that significant untapped potential remains relative to the short-term nature of the Kyoto target.

3. **Climate change must be integrated with other environmental and social priorities**. The Prime Minister has stated that one of Canada's key challenges is to improve our productivity and sustain economic growth. This is needed to improve the standard of living of Canadians and ensure that we have the necessary resources to deal with our many social priorities, including climate change. A fragile economy, on the other hand, with limited innovation and low productivity growth, would hamper our ability to respond effectively. Thus, it is absolutely essential that we have an overall policy framework that integrates our climate change objectives and actions with other key policy levers to maximize Canada's potential.

4. **Enhancing Canada's standard of living also means maintaining our competitive position and our attractiveness as a location for investment**. Canada is a trading nation and is by far the most open of the G-7 economies – our trade in goods and services makes up almost 75 percent of Canadian GDP. With growing North American economic integration, we cannot afford to be too far out of step with our neighbours to the south. As well, much of our national wealth has been built on the basis of the production and export of energy-intensive goods and these industries increasingly face competition from firms in developing countries, which have no Kyoto commitments. Canada should not jeopardize those areas of comparative advantage for no global gain in terms of environmental protection.

5. **While technological advancement will be an important component of whatever climate change strategy we adopt, technology cannot be viewed as some sort of "silver bullet" that will get Canada to the Kyoto target**. The Kyoto timeframe is too short given that the kinds of technologies that will make a significant and lasting contribution to our climate change efforts will not be commercial for some time yet. And while Canada has a number of promising climate-friendly technologies, it is doubtful that for Canada the economic benefits from the exploitation of these technologies will match the economic risks associated with an aggressive embrace of the Kyoto target. The reality is that Canada and Canadian industry have traditionally been importers of advanced technologies. Having said this, the Table recognizes that it is vitally important that Canada make prudent investments in technology development and commercialization that will provide maximum benefit over the longer term.

6. **Any effort to address climate change will need to be cumulative, long-term and truly global**. Yet, there are real questions with respect to how quickly and to what degree the international community will take action. This is due to a number of factors – remaining uncertainties with respect to the science of climate change, ongoing debate on the rules for carbon sinks and the Kyoto Mechanisms, the lack of reduction commitments by developing countries, and vague timelines with respect to ratification of the Kyoto Protocol, particularly by the world's largest emitter, the United States. Even a preliminary determination of the degree of flexibility that will be available to Canadian industry to invest in promising opportunities for offsets internationally is at least a year, and probably several years, away. This ongoing uncertainty frames what Canada can do and when.

The Industry Table's main conclusions and recommendations are as follows:

[2] International benchmarking analysis was done for the petroleum refining, chemicals and automobile and auto parts manufacturing sectors. As well, some basis exists for comparative analysis in the mining, aluminum and steel sectors.

The challenge of meeting Canada's Kyoto target is formidable and not likely achievable without major policy interventions and substantial impairment of the Canadian economy. In essence, it represents a fixed limit on the use of carbon energy and a serious constraint on the character of our future economic performance. Our analysis suggests there is no "win-win" agenda for the industry sector overall that would close the gap in short-term.

Canada should not consider ratification of the Kyoto Protocol until there is a much better understanding of the full implications for the country, the rules of the game internationally are clear as well as actions to be taken by our trading partners and competitors.

Canadian action on GHG constraints should only be considered as part of a broad international response to the climate change challenge. Adoption of measures (such as significant carbon taxes or "cap-and-trade" programs) to implement the Kyoto Protocol or similar constraint on emissions on a Canada-only basis, ahead of the rest of the world including the U.S., would involve a major sacrifice by Canadians with no noticeable impact on global emissions. Furthermore, depending on the policies chosen to constrain emissions, unilateral Canadian action could have devastating implications for the competitiveness of energy intensive industries in Canada. Even in the case of broader international action, careful consideration will have to be given to the design of measures required to address the competitiveness of industry sectors competing with those in developing countries facing no constraint or cost burden.

Governments should aggressively support the voluntary challenge and its extension to other sectors of the Canadian economy. Industry sectors will focus on development of an enhanced Voluntary Challenge and Registry (VCR) with appropriate goal-setting and mechanisms for accountability[3], will seek to deepen the commitment of Canadian industry and will continue to champion the voluntary approach beyond industry. Industry goals related to emissions and/or energy efficiency for the most part will have to be on a unit of output basis to preserve their ability to grow and become more productive. Governments should develop a strengthened policy framework to support voluntary programs such as the VCR and the Canadian Industry Program for Energy Conservation, and should recognize the value and progress sectors have made under their own voluntary programs.

Further development of the national strategy must proceed on the basis of sound fundamentals for decision-making, including:

- Focus on least cost options per tonne of GHGs;
- Comprehensive micro and macro assessment of the costs and benefits of Kyoto;
- Cost-benefit analysis of individual measures and the interactions between measures;
- Consistency with other environmental, social and economic goals;
- Regional and sectoral equity;
- Maintenance of the country's competitive position;
- A balance of mitigation and adaptation measures;
- Clear delineation of federal and provincial responsibilities;
- Participation and engagement of all Canadians.

The Table was not able to come to a definitive position on emissions trading. The subject requires much more study and analysis and emissions trading should not be considered as a "Phase I" measure in the NIS. A program of mandatory "cap and trade" must be shown to offer significant advantages over alternative policy instruments before one is implemented in Canada. Key issues for further study and consultation include understanding the competitiveness implications of different allocation schemes and how best to deal with capital stock turnover, adjustment costs and equity issues. Also critical will be consideration of how a Canadian emissions trading scheme can be integrated with the system of international emissions trading which may be established under the Kyoto Protocol, and with any trading program that may be developed by the United States.

3. One member believed that enhancement of the VCR should be the subject of separate work by VCR stakeholders.

The Industry Table believes that early actions are warranted which can further "bend the line" of Canada's GHG emissions trajectory. As part of this first phase of the national strategy, governments should develop supportive public policies in the following areas:

Embodied emissions in exports: An important component of Canada's climate change challenge relates to our position as a leading producer of energy intensive commodities for world markets. The emissions resulting from this production are added to Canada's GHG inventory while other countries use the products without needing to account for the associated emissions. As an example, a substantial proportion of the natural gas we export to the United States is likely to be used to displace more carbon intensive fuels in electricity generation. The federal government should continue to examine this question and explore opportunities to gain greater recognition internationally for embodied emissions in exports.

Co-generation: Government policy must fully support the considerable potential for co-generation in some industry sectors, through progressive removal of existing barriers.

Financial incentives: The Table supports further analysis of the potential for financial incentives to stimulate investments in emissions reduction activities. They must be situated within a sound fiscal framework, and any such incentives will have to demonstrate that they offer considerable advantage in terms of their cost-effectiveness in comparison to alternative policies. As well, it will be critical to avoid measures which could attract countervail actions, particularly in the United States.

Monitoring developments internationally: Both government and business should carefully monitor approaches in other OECD countries, especially those related to innovation, technology development and market-based instruments. We will need to pay attention to the pace and design of policies in our trading partners. Canadian firms will need to assess the risks of failing to respond as quickly as major competitors in the global race to supply more climate-friendly products and technologies. The federal government can assist in part by providing enhanced logistical support for companies pursuing foreign offset opportunities.

R&D and climate change technology: Governments should invest in appropriate Canadian research related to the science of climate change and adaptation measures. They also should increase support for strategic R&D and technology demonstration to enhance the development of low-cost emissions reductions opportunities over the medium to longer term. Government and industry can work cooperatively to strengthen climate change technology assessment in Canada through appropriate centres of excellence and international networks.

Recognition for Action[4]: Federal and provincial governments should move expeditiously to develop a baseline protection program. However, baseline protection will only ensure that companies which take early action are not disadvantaged should mandatory limits later be imposed. Governments should continue to explore options for a simple, equitable and cost-effective credit for early action (CEA) system in full consultation with stakeholders.

Public Education and Engagement: Climate change is a broad, societal issue requiring enlightened engagement by all segments of society. Industry is committed to doing its part but overall progress depends upon the actions of many others, including millions of individual Canadians. The Canadian public must be educated about the science and economics of climate change and the cost and benefits of various policy options, and need practical examples of actions they can take. In addition to governments, Canadian industry has a role to play, both by demonstrating leadership through its own efforts, and in educating its customers, employees and other companies about responsible climate change actions.

4. The Table received a minority report that objected to the establishment of either a baseline protection or CEA system (for full text see Appendix A). On the other hand, some members argued for development of a CEA system as a priority measure (see Appendix A and sections 3.4.1 and 3.8).

Members of the Industry Table and the sectors they represent recognize that we must be substantial contributors to Canada's climate change solution. We can show innovation and creativity in the search for opportunities that take us beyond business as usual, but that also are firmly grounded in the realities of our respective businesses and of the Canadian situation. We can bring about a better understanding of the issue, by doing our part to educate customers, suppliers and consumers, and also by insisting on solid analysis of the challenges and opportunities for Canada and of the overall costs and benefits of different approaches. And through our networks internationally, we can urge the development of a longer-term and truly global strategy that addresses the risks of climate change while also spurring positive engagement and enhanced capacity in the developing world through strategic investments. We intend to continue to work towards a Canadian approach that meets all of these objectives.

CHAPTER 1 – THE CLIMATE CHANGE CHALLENGE

1.1 The Context for the Industry Table's Work

It is often said that climate change is a long-term global issue which requires a long-term and truly global response. It is also true that on a national basis, emissions reductions and the efficient use of energy are everyone's business. Canada must be a player in the global response to climate change, but we also must ensure that the national strategy which we design over the next decade will support and enhance the economic fortunes of the country and the aspirations of individual Canadians for an improved standard of living.

Canadian industry is fully committed to playing a constructive role in developing Canada's national greenhouse gas strategy. The Industry Table believes it is essential to understand the environmental, economic and social implications of Canada's Kyoto commitment before deciding on a national strategy and before any judgment is made on ratification of the Kyoto Protocol. We need to fully assess Canada's strengths and vulnerabilities vis-à-vis climate change, assess best-value strategies and determine appropriate timing for action. In approaching this task, the Table also believes that it is important to place Canada's climate change challenge in the appropriate context.

The challenge represented by the Kyoto target is a formidable one for us as a country. The federal government made a commitment in Kyoto to reduce our emissions of greenhouse gases to 6 percent below 1990 levels by the period 2008 to 2012. This represents a 26 percent reduction from what emissions would otherwise be by that period, and would require an unprecedented level of improvement in the way in which we use energy throughout Canadian society. Numerous industry sectors have made considerable strides in reducing the emissions intensity of their production, and have done so for good business reasons. However, for the most part these gains have been overtaken by the overall growth in the economy. Canada's Kyoto commitment has significant implications for a country whose population is growing at a faster rate than most other industrialized countries and that has built a considerable degree of its national wealth on the basis of the production and export of energy and energy-intensive goods.

Climate change is a societal issue and to make real progress will require a sustained commitment by all members of society. Industry will continue to do its part, but the extent to which progress can be made on our Kyoto targets depends fundamentally on the actions of others. Solutions must address all sources in an equitable manner and ensure that climate change policies are consistent with overall public priorities. Fundamental to this approach is to broaden Canadians' understanding of the climate change issue and their own contribution to the problem. Alternative approaches must be fully analyzed and debated, and Canadian actions must be judged in light of corresponding policies in other countries. Canadians will need to be apprised of the likely impact on their lifestyle and incomes in order to ensure a Canadian strategy that will stand the test of time. And a longer-term strategy is essential to allow adequate time for adjustment and to ensure Canada can invest in and take advantage of new, lower emission technologies.

It also is important to recognize that climate change must be seen as one element of an overall public policy agenda that seeks to raise Canadians' living standard and improve the productivity and international competitiveness of Canadian industries. As a highly outward-oriented country, in which the ratio of exports to GDP is more than twice that of all G-7 countries, Canada is especially vulnerable to developments that could negatively impact on the competitiveness of domestic firms. The increased global attention to climate change creates new opportunities for Canadian businesses. It also creates some new and difficult choices. In developing a National Implementation Strategy, there must be an understanding and appreciation of the factors that will influence the way firms in different sectors incorporate climate change considerations into their individual corporate strategies to strengthen competitiveness.

The mandate of the Industry Table contains three important elements:

1. To develop a broader understanding of the challenges and opportunities facing industry in responding to climate change, from an environmental, economic, technological and competitiveness perspective;

2. To evaluate a range of options for reducing greenhouse gas emissions in the context of the National Implementation Strategy, including those developed by both the Industry Table and other Tables, to assure a clear and broadly shared understanding of the implications for Canada's competitiveness and for impact by region/sector; and

3. Such work will seek to recommend solutions that will contribute to the competitiveness of Canadian industry and result in no undue burden upon any region or sector.

The Table agreed to evaluate actions by industry and measures by governments that taken together could reduce industry GHG emissions to the levels implied by the Kyoto target. This task was considered in light of the widely varying circumstances and emissions profiles of the sectors represented at the Industry Table, and the actions that already have been taken since 1990 to address industry emissions.

The main analytical work was conducted through a series of seven sub-tables – upstream oil and gas, petroleum refining, chemicals, minerals and metals, transportation equipment manufacturing, "other" manufacturing, and small and medium enterprises[5]. This was viewed as the most effective way to conduct a thorough analysis of the technical opportunities for GHG reduction in industrial sectors, and to consider the specific implications of implementing Kyoto on those sectors. However, this approach does suffer somewhat from a "silo" orientation, and time did not allow for a thorough analysis of the implications which actions in one sector could have on other related sectors in the supply chain. Nor was there time or opportunity to gain a good understanding of how measures recommended by other tables could affect the major industry sectors. And while the assistance of the Analysis and Modelling Group (AMG) and the "micro" modellers was sought to estimate the potential for certain "cross-cutting" measures applied to industry more generally, the conclusions therefrom are preliminary at best.

This has been the most comprehensive examination ever undertaken of the sources of industrial emissions and opportunities in the field of energy efficiency, technology deployment, fuel-switching and management of greenhouse gases. Nonetheless, it must be considered incomplete. The analysis has identified a number of promising opportunities and revealed important areas of interaction and synergy. This information and insight will serve the country well whatever our eventual long-term response to climate change. But this exercise also has illustrated how much more is needed to make our understanding complete and has revealed how dependent each sector is on the actions of others, both at home and internationally.

The Industry Table's aim has been to find ways to reduce greenhouse gas emissions while maintaining a vibrant Canadian economy that continues to contribute jobs and wealth to Canadians. Our industry options paper provides some critical insights into how Canadian industries have been continuously improving energy efficiency and the challenges they face to move forward in this area. In the absence of breakthrough technologies, extreme or dramatic solutions are likely to be exceptionally expensive for Canadians with little overall impact on the global problem. Therefore our report has focused on practical actions that we believe have real potential over the long run to tackle the greenhouse gas issue and maintain Canadian competitiveness. A strong industrial sector and a growing economy, which are needed to create new employment opportunities and to allow Canadians to enjoy higher living standards, are also key to generating the technologies, investment and resources needed to respond effectively to climate change.

[5] Two important industry sectors, forest products and agri-food, were excluded from this exercise, since they were covered by the Forestry Table and the Agriculture and Agri-Foods Table respectively. Nonetheless, specific examples from these sectors have been included in this paper in order to give a somewhat broader industry perspective.

1.2 Canadian Industry and Climate Change

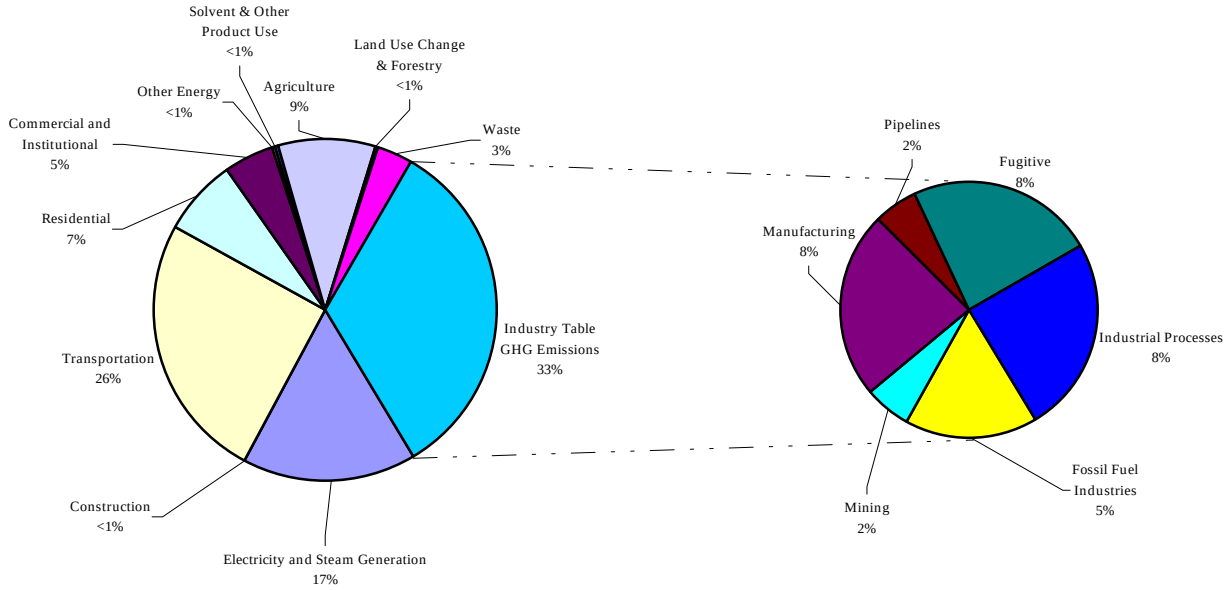
The GHG emissions of Canadian industry must be viewed in the context of the importance of energy industries and energy-intensive industries to this country's economic development. Despite the evolution of the economy and structural changes over the post-war period that have significantly increased the importance of services, Canada is still significantly dependent on fossil fuel-based industries and will continue to be so well into the future. Energy industries and energy-intensive industries together account for almost 5% of total employment and over 10% of GDP. Canada relies much more heavily on exports than most other developed economies and it derives a substantial share of its export revenues from major GHG-emitting industries. In 1997, for example, 36% of Canada's merchandise trade revenue came from the export of five emission-intensive product groups (mining products, ores and minerals, fuels, iron & steel, and chemicals). This was twice the share of these export categories in U.S. merchandise trade, and 50% higher than their share in the exports of the European Union.

1.2.1 Industrial Sources of GHG Emissions

Emissions from sources represented at the Industry Table (including fossil fuel production) account for approximately one third of all Canada's GHG emissions. A further 26% of Canada's emissions are attributable to transportation, and another 17% to electricity generation - both of which are services employed by industry.

Figure 1

Sources of Economy Wide GHG Emissions, 1997



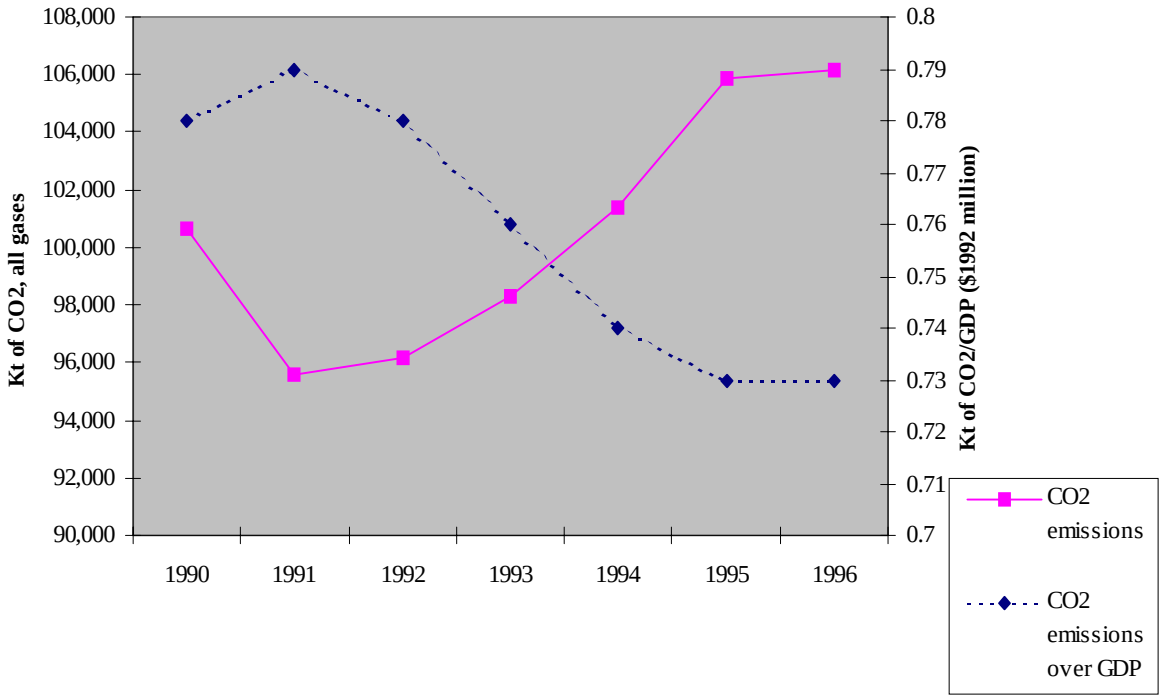
Source: Canada's Greenhouse Gas Inventory,
1997 Emissions and Removals with Trends

In Figure 1, the 33% of GHG emissions due to industrial and fossil fuel-related activities are disaggregated using 1997 data from Environment Canada. It can be seen that, among industrial activities, the major sources of emissions are industrial processes (e.g. cement production, chemical production), and energy combustion in manufacturing. In the case of fossil fuels, the main source of CO_2 emissions is combustion, while methane emissions result primarily from fugitive releases that occur in the production, processing, transmission, storage and use of fuels.[6]

Between 1990 and 1997, GHG emissions from the activities in Figure 1 increased by 17%. Large increases occurred in emissions from pipelines and oil sands activities, and in fugitive releases. While emissions from energy combustion by manufacturing firms declined, there was a significant increase in GHG emissions from industrial processes. These trends reflect the impact of growth and shifts in economic activity. As well, they demonstrate the impact of the increase in Canadian exports of oil and natural gas to the United States, some of which is having a beneficial effect on GHG emissions in the U.S. Emissions would have grown still more strongly as a consequence, were it not for important improvements in fuel and energy use.

Figure 2

GHG Emissions from Energy Combustion, Manufacturing, Mining, Oil & Gas



Source: Based on data provided by Environment Canada

[6]Environment Canada defines fugitive emissions as "intentional or unintentional releases of gases from anthropogenic activities". They include releases from (non-combustion) equipment exhaust, leakages, upsets and mishaps. Emissions from combustion are counted as fugitive only where they do not support a productive activity (e.g. the flaring of natural gases at oil and gas sites).

Figure 2 shows the growth in GHG emissions from fuel combustion that occurred over 1990 to 1996 as manufacturing, mining, and oil and gas industries expanded and their energy requirements increased. A growth in the relative importance of more energy-intensive activities also raised energy use. But while energy-related emissions increased overall by 5.5%, emissions per unit of output fell by 6.4%. The latter is the result of shifts from oil to less carbon-intensive fuels and electricity, and of progress achieved within particular industries to improve energy efficiency.

1.2.2 Industry Achievements

The scope for reducing GHG emissions varies considerably between sectors. The companion foundation papers prepared by the Industry Table elaborate on this and describe the specific measures taken by producers in different industries to reduce emissions. Among the achievements highlighted in the foundation papers are the following:

- In petroleum refining, extensive industry rationalization and increases in capacity utilization have contributed to significant improvements in energy efficiency. Between 1990 and 1997, energy consumption by refineries (excluding upgraders) declined by 7%, energy intensity per unit of production improved by 14%, and refining CO_2 emissions fell by 3%.

- In the chemical sector, CCPA's Responsible Care® program is the basis of member's actions to manage all environmental aspects of their operations, including actions related to climate change. Through the application of innovative technology, by 2001 emissions of nitrous oxide will have been reduced by 90% since 1992. The energy-intensive industrial chemicals and synthetic resins sector has reduced energy costs and CO_2 emissions per unit of output by improving energy efficiency. A significant amount of steam and electrical needs of the sector are currently being met by co-generation technology. Between 1992, the year marking the bottom of the last cycle, and 1997, shipments increased by 24% but GHG emissions rose by only 2.8%. Over this period, carbon dioxide emissions per unit of output were reduced by 15%.

- The iron and steel industry is improving energy efficiency through higher yields, increased processing of recycled materials and greater reliance on mini-mills, which use less energy than the integrated mills through recycling. Between 1990 and 1997, adjusting for the strike that artificially depressed production in 1990, the industry achieved a 19 percent reduction in energy consumed per tonne shipped. Adjusted total GHG emissions declined by about 16% over 1990 to 1996, resulting in a ratio of 1 tonne of CO_2 per tonne of raw steel produced. Increased application of new light weight steels can further improve energy efficiency in road vehicles, trains, construction and pipelines.

- The aluminum industry, while increasing production by sixty percent between 1990 and 2000, has increased CO_2 equivalent emissions by only six per cent. Consequently, CO_2 equivalent intensity has been decreased by more than a third, falling from 6.4 to 4.2 tonnes per tonne of aluminum produced. These reductions have been achieved primarily through a reduction of PFC emissions by replacing old technology with state of the art smelters and retrofitting older plants still in use with better process controls. In addition to reduced process emissions, the aluminum industry is making substantial contributions to reducing overall CO_2 equivalent emissions through recycling and the production of lighter-weight consumer products. While the industry continues to reduce energy intensity at a rate of approximately one per cent per year, its ability to effect CO_2 equivalent emissions reductions through this process is limited, as it draws 88 per cent of its energy needs from hydro-electricity, one of the lowest intensity CO_2 equivalent sources of power.

- The Canadian pulp and paper industry has cut fuel oil purchases in half since 1989, and now meets almost three quarters of its energy needs from renewable resources, primarily biomass. The use of renewable resources helped the industry reduce CO2 emissions by 12% overall and by 24% on a per-tonne basis between 1990 and 1996.

- The Canadian Industry Program for Energy Conservation (CIPEC) has played a significant role in promoting voluntary actions to improve energy performance in the manufacturing and metal/non-metal mining sectors (including the sectors highlighted above). The more than 3000 mining and manufacturing companies represented by the 31 trade associations participating in CIPEC reduced energy intensity by 0.9% per year from 1990 to 1997. Over this period, despite strong growth in output (17.2%), CIPEC participants succeeded in limiting the increase in energy-related CO_2 emissions to a mere 0.5%.

- The upstream oil and gas industry is working to reduce its energy intensity and also is working to reduce methane fugitive emissions. The oilsands are reducing energy intensity per m3 of production by 31% from 1990 levels by 2001.

Notwithstanding impressive achievements by a number of sectors in reducing the emissions intensity of their production, the story for the industry sector as a whole is more complex. GHG emissions for industry generally have increased since 1990 (as they have for the country as a whole), due in large part to impressive levels of economic growth in the latter part of the 1990s. As an example of the challenge which the country faces in integrating environmental and economic goals, the oil and gas sub-table has pointed out that it has achieved significant improvements in energy intensity per unit of production (especially in oil sands mining). Nonetheless, overall emissions from the upstream oil and gas sector are expected to increase significantly between now and 2010 because of a projected increase in production from 1990 to 2010 of 76 percent for oil and 91 percent for natural gas. Much of this increase in production will be exported to the United States, and by 2010 close to half of the sector's emissions will be associated with exports.

Another example is the transportation equipment manufacturing sector, which has been a significant source of Canada's export earnings. The sector is less energy intensive than many industry sectors (CO_2/GDP is one fifth the industry average) and has many highly efficient manufacturing facilities. Since 1990, production and emissions from this sector have both grown in the range of 35 percent, reflecting in large part the improvement in the business cycle and the competitive position of the Canadian industry.

1.3 Challenges and Strategic Considerations

What approaches and strategies will help Canada reconcile its potential obligations under the Kyoto Protocol with the broader objective of ensuring a vibrant and competitive economy that contributes to increasing economic prosperity? This issue must be addressed in the context of the lacklustre performance of the overall Canadian economy in recent decades. The average family has seen its income, adjusted for inflation, edge up only marginally from where it was in 1980. Over the past decade, real family incomes have declined. Labour productivity, which is a key determinant of living standards, increased, in the business sector, at an average annual rate of only 1.0% between 1979 and 1997. In the manufacturing sector, productivity growth has been far below that of the U.S. and the average gap in productivity levels between Canadian and U.S. producers is now about 25 percent. Thus, it is important that climate change initiatives are consistent with efforts to raise Canadians' living standard and improve the productivity and international competitiveness of Canadian industries.

1.3.1 Technology Development and Opportunity

Climate change concerns are giving rise to significant new market opportunities for Canadian firms. Producers of energy saving technology as well as manufacturers of energy-saving materials, for example plastics and high-strength, lightweight materials such as steel, aluminum and magnesium, stand to benefit from a growth in global demand. Canada's environmental

industry[7] includes firms that have developed important niche markets in energy-efficient technology and processes. As well, a number of Canadian firms outside the environmental industry, are leading the way in the development and application of energy efficiency technologies. Examples of leading edge technologies developed and applied by Canadian firms include:

- The Ballard Fuel Cell;
- The IOGEN enzyme-based biomass ethanol technology;
- Solarwall ventilation systems designed by Conserval Engineering;
- Building retrofits to cut emissions and reduce energy consumption marketed by Rose Technologies;
- Suncor's investment in wind power and carbon sinks;
- Pan Canadian's application of new CO2 sequestration technology to extend the life of a Saskatchewan oilfield; and
- Building on pioneering work done at the National Research Council in the field of reverse osmosis membrane separation, Zenon Environmental of Burlington has developed a world class water treatment business. Other energy efficient membrane separation technologies are increasingly finding applications in such areas as food processing and biotechnology.

This is a small sample of the innovative solutions Canadian firms are developing to address climate change concerns. Still, Canadian environmental firms are relatively small players in North American and global markets for environmental goods and services. Undoubtedly responding to the threat of climate change will be one of the factors that feeds a growing global market for cleaner and more energy efficient technologies. It remains to be seen what portion of that market can be claimed by Canadian technologies. Nonetheless, outside the environmental industry, the development of new technologies is likely to be limited simply because most Canadian firms devote relatively few resources to R&D. Canadian firms are primarily adopters rather than developers of new technology. In meeting climate change requirements, as in other areas, Canadian firms are likely to mainly acquire needed technology through machinery and equipment imports and other traditional vehicles of technology acquisition such as foreign direct investment and the hiring of foreign expertise.

1.3.2 Energy Efficiency and Competitiveness

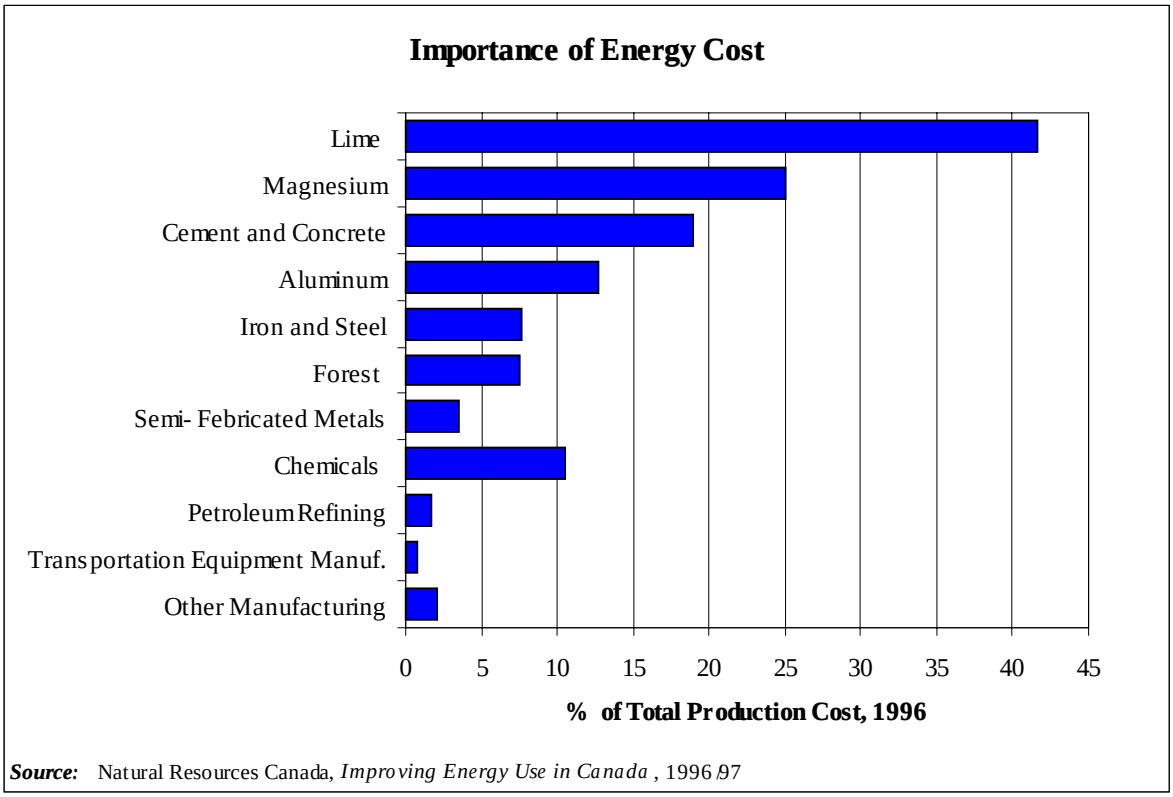
By pursuing opportunities to reduce GHG emissions through improved energy efficiency, Canadian firms may be able to strengthen their competitiveness. There are a number of examples of firms that have found energy conservation measures can help industrial performance. Agrium Inc., for example, a major fertilizer producer with plants in Alberta and Saskatchewan, has developed facilities that are among the most energy-efficient and also the most cost-efficient in the industry. The cost savings that Ancast Industries, a Winnipeg metal caster, have achieved from investing in high energy efficiency equipment and production processes, are seen to be an important factor in the company's success.

Energy efficiency is a more important consideration in some industries than others. The possibilities for improving competitiveness through energy efficient investments are greatest in those sectors where energy represents a significant proportion of production costs (see Figure 3). Even so, in certain energy intensive industries, energy requirements of production are relatively fixed, so that cost reductions (through economies of scale, higher productivity etc.) serve to

[7] Based on 1997 data, the Canadian environmental industry had sales revenue of $11.5 billion and employed approximately 140,000 people, with about 41% of output accounted for by environmental services.

increase the relative proportion of energy costs. For example, the lime industry has a base energy requirement that is dictated by the chemistry of lime production. Therefore, despite energy costs being the most significant cost of lime production, the opportunities for increasing energy efficiency are few, and to a large degree those opportunities have already been taken. As well, for many industries, energy costs account for a small share of total expenditures (i.e. under 5%) and the potential competitive gains from improved energy efficiency are more modest.

Figure 3



Source: Natural Resources Canada, *Improving Energy Use in Canada* , 1996/97

The returns from investment in new energy technology depend on other industry-specific, as well as firm-specific factors. Some sectors are confronting marketplace shifts that complicate the achievement of energy-conservation objectives. In the wood products sector, for instance, the strongest demand growth has been in energy-intensive products such as strand board and new structural materials. As discussed above, many energy-intensive industries have already achieved substantial improvements in energy efficiency. Through voluntary initiatives, firms have taken advantage of many of the most promising opportunities for the introduction of energy-efficient equipment and production processes. While technological advances will conceivably open up important new opportunities in the future, in the interim, some sectors are looking at the need to incur sharply increasing expenditures to achieve further improvements in energy efficiency.

The attractiveness of energy efficiency investments also depends on the nature of the firm's competing investment demands. Investment planning involves the assessment of options and the ranking of alternatives. This exercise will yield different results in different areas. In highly energy-intensive sectors, firms have a strong incentive to investigate fuel-switching opportunities, to adopt more energy efficient technologies and to make better use of excess heat and steam. In some sectors, however, the most promising investments lie in the development of new products or in modernization and restructuring projects that do not yield accompanying

gains in energy efficiency. For small and medium-sized enterprises with very limited investment capital, there are especially strong economic pressures to avoid projects with the long paybacks that are typical of energy-saving measures.

1.3.3 Energy Efficiency and Systems Integration

Although there are no obvious shifts in technology that can dramatically reduce the consumption of energy in industry there remains a significant opportunity for reductions in all forms of energy use. The opportunity resides in the effective application of existing technologies, the internalization of energy management behaviors and the optimization from an energy use perspective of industrial processes and their auxiliaries at an integrated systems level.

Companies typically measure energy use but very few analyze the data that is archived and turn it into information which can provide decision support that leads to energy consumption reducing actions on a continuous improvement basis. Few companies have integrated energy management actions with line operating procedures. Further more new project engineering generally only goes as far as to select energy efficient components and rarely does it reach the level of energy efficient engineering which requires detailed analysis of energy use at a system level.

Process Integration (PI) is a systematic approach to improve the energy efficiency of industrial facilities and can offer significant savings for Canadian industries. This technique is primarily used to optimize the use of resources such as energy, water, raw materials and capital expenditures. PI may also result in tighter process and quality control, and improved environmental performance. PI can be applied to systems of varying levels of complexity, including a process, an industrial site, or a region.

Process Integration uses analytical techniques, mathematical models, as well as in-house process expertise to achieve these savings. PI`s integrative approach, combined with a facility-based consultative process ensures that corporate parameters are incorporated into energy efficiency modifications. In this way, environmental sustainability, safety and return on investment also become integral considerations.

Process Integration applies to many industrial branches and can be used for planning, design, redesign and to some extent operation of both continuous and batch processes. PI has in the past resulted in implemented actions that have reduced energy consumption, typically by 10-40 %, with acceptable returns on investment. This is achieved through improved heat recovery, better heat and power solutions, water and wastewater minimization and, in some cases, modifications to the process itself. PI is also a tool for identifying the potential for energy exchange between industrial sites, power stations and communities (district heating and/or cooling). It is an integrated approach that can help Canadian industries to significantly improve their energy efficiency and, consequently, reduce greenhouse gas emissions.

Industries that use significant volumes of water and/or energy can generally benefit from PI. The oil refining, petrochemical, chemicals, pulp and paper, food and drink, textile, iron and steel, and metallurgy sectors, among others, can particularly benefit from PI.

As an example of a PI application, the CANMET Energy Diversification Research Laboratory has recently completed a Process Integration project in a pulp and paper mill. Opportunities to reduce the freshwater consumption by 80% have been identified while respecting all process constraints. Energy savings of 50% in the wastewater treatment system have also been identified. Work is currently underway to apply PI in another pulp and paper mill as well as in a textile dyehouse.

Accordingly, there exists an opportunity to improve the energy efficiency and carbon efficiency of industry by optimizing the application of existing technologies by means of in depth data analysis and energy efficient engineering at the systems level. This behavior can be motivated in part by government incentives.

1.3.4 Timing and Capital Stock Turnover

In some circumstances, an industry's investment cycle will be the major factor determining how quickly energy-efficient technologies are adopted. The pattern of industry investment is an important consideration where what's needed is not incremental equipment and process changes but rather a major renewal of a firm's capital stock. Firms will be reluctant to prematurely scrap their existing facilities, since the resulting losses are likely to exceed the expected savings from the adoption of more energy-efficient technologies.

While capital stock turnover is relatively rapid in some industries, such as motor vehicle manufacturing and auto parts, it is slow in other industries, including some sectors requiring large-scale energy-saving investments. In the aluminum sector, for example, although some savings can be achieved through process improvements, further progress in the reduction of greenhouse gas emissions requires the construction of state-of-the-art smelters. As new smelters cost over CA$2 billion, older aluminum smelters will be replaced as economic conditions permit. (The industry intends to replace its remaining HSS plants by 2015.)

1.3.5 Competition for Investment Capital

In a world in which there are few barriers to international investment and in which the co-ordination of cross-border business activities has been greatly facilitated by advances in information and communications technology, firms have considerable choice as to where to locate their business activities. In a highly competitive global environment, moreover, firms are under pressure to take advantage of this choice by situating their activities in countries with low production costs or other important advantages, such as resource availability or ready access to large markets.

While there have been concerns that these global pressures would lead to a flight of investment from industrial nations to developing countries with perceived lower environmental standards, available evidence suggests this has not happened. Major corporations are unlikely to use outmoded technologies, for environmental and economic reasons, and most have policies that require them to follow best environmental practice in all their facilities. At the same time, however, in the current highly competitive global marketplace, corporations are necessarily sensitive to policies which significantly affect production costs.

If Canada were to apply climate change measures that involved compliance costs substantially above those in other industrial countries, this would certainly reduce this country's appeal as an investment location for heavy GHG-emitting industries. Such a policy can be expected to add to concerns that have arisen over the past decade as Canada has seen its share of G-7 inward foreign investment stock shrink by nearly half (i.e. from 16% to 8%). Firms may be reluctant to close existing plants and write off their capital assets, but they would be less likely to increase their investment in Canada. Canadian-owned firms in major GHG-emitting industries would have a strong incentive to pursue investment opportunities in lower-cost foreign locations. In the chemical sector, and other industries subject to substantial foreign control, Canadian subsidiaries would face increased difficulties competing for mandates.

1.3.6 Competing Environmental Priorities

In coming years, many major GHG-emitting industries are committed to further reducing emissions that affect Canada's air and water quality. The required emission-reduction technology is not always consistent with what is required to improve energy efficiency. In the petroleum products sector, for example, meeting increasingly stringent sulphur content requirements in gasoline will require refineries to employ technology that increases carbon-dioxide emissions. In the cement industry, the implementation of measures to reduce nitrous oxide emissions and combat smog, can have a detrimental impact on carbon dioxide emissions and vice-versa. In the transportation manufacturing sector, regulations requiring producers to alter their paint processes to reduce emissions of volatile organic compounds have contributed to higher CO_2 emissions.

In other situations, firms must make choices in allocating limited resources among competing environmental priorities. In primary steel, for example, firms have to balance the need for equipment upgrading and process improvements to control effluents and emissions of airborne particulates with the need to respond to climate change concerns. In the chemicals sector it is important to ensure that climate change initiatives complement and are balanced with other environmental priorities such as toxic substances and air quality. In public discussions and in government policies, there has not been adequate recognition that such tradeoffs exist. A national strategy should provide guidance on how competing requirements are to be balanced.

1.4 The International Dimensions

Many of the key decisions that will determine the impact of the Kyoto Protocol on Canadian industry will be made in other countries. Developments in the U.S., which is the destination of almost 80% of Canadian exports, are of special significance. In this section, we highlight important aspects of this international dimension of the competitiveness issue.

1.4.1 Decisions of Major Trading Partners

There are a number of uncertainties about how Annex 1 countries will implement their commitments under the Kyoto Protocol. It is unlikely that the needed ratification by 55 countries with 55% of Annex 1 emissions will occur until at least 2002. Of particular significance is the position of the United States, which makes up approximately 34 percent of Annex 1 emissions, and which has given few signals that it intends to ratify in the near term.

Assuming Canada's major trading partner does ratify the Protocol, economic projections suggest that Canada and the U.S. must reduce GHG emissions from where they would otherwise be in 2010 by roughly similar percentages (i.e. 25 - 30%) to achieve their Kyoto targets. This may translate, however, into measures that will impact very differently on particular industries in the two countries. Costs of compliance will be affected by a number of factors.

First, there will be differences in the extent to which Canada and the U.S. take advantage of various provisions which add flexibility to the Protocol. Annex 1 countries can engage in emissions trading and they can earn credits for participating in Joint Implementation (JI) projects that reduce emissions or enhance emission-absorbing sinks in other Annex 1 countries. Under the Clean Development Mechanism (CDM), countries can also earn credits for projects that reduce emissions and produce measurable long-term benefits for non-Annex 1 countries. In addition, countries can reduce their emission-reduction requirements by enhancing carbon-absorbing sinks through reforestation and afforestation. Canada has been trying to build support internationally to recognize carbon sequestration in soils as a legitimate sink activity. The Forestry and Sinks Tables have been examining the potential to utilize Canada's forest stocks as sinks and to enhance the carbon absorption capacity of soils. Although considerable analysis still needs to be done, Canada’s potential with respect to forest sinks may be somewhat limited and relatively expensive on a $/tonne GHG basis, especially within the Kyoto commitment period, and this could cause firms to look internationally for such opportunities. Canadian firms also have capacity to transfer energy saving technology and expertise to developing countries under the CDM. However, because the rules applying to sinks and the rules to govern emissions trading and the JI and CDM mechanisms have still to be worked out, it is difficult to assess how these mechanisms will affect compliance costs in Canada and the U.S.

Second, the possibilities for reducing GHG emissions differ significantly among countries. There is comparatively greater potential in some countries for reductions in the emissions of methane, nitrous oxide and synthetic greenhouse gases,[8] thus reducing the need to cut back on

[8] These include hydrofluorocarbons, perfluorocarbons and sulfur hexafluoride. In the case of these gases, countries have the option of using 1995 as the base year for calculating reductions.

energy-related carbon emissions. The opportunities for reducing GHG emissions outside the industrial sector also differ among countries. Where there are major possibilities for improving energy efficiency or for substituting less carbon-intensive fuels in transportation, electricity generation, agricultural production, or in residential or commercial activities, a smaller share of the overall compliance costs in meeting the Kyoto targets will fall on the industrial sector. An important example from a Canadian perspective is that of the United States, which obtains much of its electricity through coal generation and could conceivably satisfy a significant part of its overall commitment by relying more heavily on nuclear power or on generation using natural gas and renewable fuels. Canada, on the other hand, generates a much larger share of electricity from "climate friendly" sources. Accordingly, other sectors, including industry, could be expected to bear a comparatively heavier burden.

Moreover, within the industrial sector itself, the burdens of reducing GHG emissions are likely to be distributed quite differently among countries. Even if the industrial sectors in Canada and the U.S. face similar overall reduction targets, individual Canadian producers may find they bear a disproportionate share of the overall burden in comparison to their U.S. rivals. Canadian firms may also be disadvantaged because they have already exhausted low-cost options for energy savings; Canadian firms may find themselves in a position where they have to look to more elaborate and more costly production changes than their foreign competitors to meet GHG emission reduction requirements.

Third, compliance costs will be influenced by the nature of the policies governments adopt to meet their Kyoto targets. Costs will tend to be higher where governments implement highly prescriptive policies rather than market-based approaches which encourage firms to look for ways of minimizing the negative impacts of GHG reduction requirements on productivity and production costs. Industry impacts will also depend on the offsetting measures governments implement. If revenues are raised through carbon taxes or the auctioning of carbon permits, for example, how are these revenues recycled back into the economy? Do producers benefit from incentives to encourage innovation or do they obtain support to help allay the costs of technological adjustments? Canadian firms will be disadvantaged if their foreign competitors benefit from more flexible policy approaches or more generous government support.

1.4.2 Competitiveness vis-à-vis Non-participating Nations

While there is hope that developing nations will voluntarily agree to reduce their GHG emissions, Non-Annex 1 countries have no emission reduction targets under the Kyoto Protocol. Canada, along with other industrialized countries could, therefore, face increased competition in emission-intensive products from non-participating nations. Assessments of the economic impact of international policies indeed suggest that, over the period to 2010, South Korea and Brazil will achieve significant export gains in iron and steel; Indonesia, Chinese Taipei and China will expand their sales of chemicals, rubber and plastic products; and Indonesia and Chinese Taipei will become more significant players in global markets for nonferrous metals.[9] Even if Canadian producers do not confront increased competition from Annex 1 countries, they must position themselves for more intense competition in the U.S. and other important markets for fossil-fuel intensive exports.

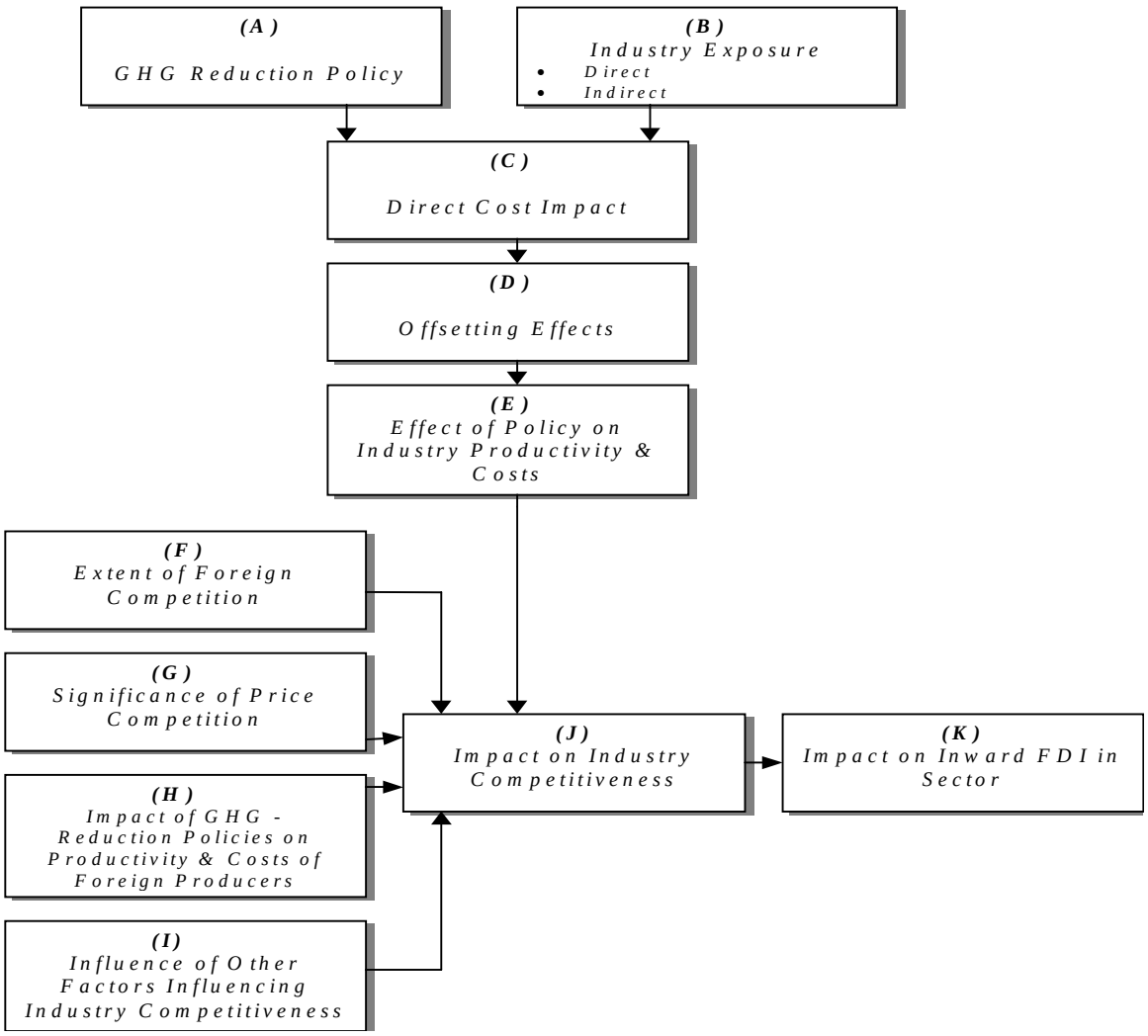
1.5 Framework for Assessing Competitiveness Impacts

Climate change policies will impact more severely on some industries than others. The way various factors will interact to affect industry competitiveness can be understood using the framework illustrated in Figure 4.

[9] Australian Bureau of Agricultural and Resource Economics, *The Economic Impact of International Climate Change Policy*, Research Report 97.4, 1997.

Figure 4

A Framework for Analyzing the Impact of GHG – Reduction Policies on Competitiveness



The top half of the flow chart focuses on the impact of Canadian GHG policies on the productivity and costs of Canadian industries. The direct cost impact (Box C) depends on: i) the nature of the GHG reduction policy, and ii) the industry's direct or indirect exposure to GHG policy actions. In terms of policy, the key factors are the policy objective (i.e. the extent of the GHG cutbacks targeted over a specific period); the flexibility of the approach (i.e. whether market-based approaches that allow firms themselves to chose how best to meet policy objectives are adopted); and the availability of subsidies and accompanying programs to support the efforts of firms to reduce GHG emissions. Industry compliance costs will increase as the policy objective becomes more ambitious, the policy approach becomes more rigid, and government support becomes less generous. An industry's direct exposure depends on its GHG emissions

and the importance of fuel costs in relation to its total costs. It also depends on the costs of implementing the production changes needed to further reduce GHG emissions. Industries that emit heavy quantities of GHG, for whom fossil fuel expenditures comprise a significant proportion of total costs, and that have already exhausted available low-cost options for reducing emissions, are heavily exposed to GHG reduction policies. An industry may be indirectly exposed if it obtains a major portion of its purchased inputs from industries with substantial direct exposure.

Over time, firms may be able to mitigate the negative impact of GHG-reduction policies through new production processes or the adoption of new technology. The significance of the offsetting effects (Box D) will depend on whether the policy encourages firms and their suppliers to look for new ways of meeting Canada's GHG-reduction targets. The strength of offsetting effects also depends on various industry-specific factors, including the different technological opportunities for energy efficiency and the differences in industry investment cycles.

How will a decline in productivity and an increase in production costs affect an industry's competitiveness? As outlined in the bottom half of the flow chart, this depends on a number of considerations. First, it depends on the extent of foreign competition (Box F). Firms have less reason for concern if they primarily compete against domestic firms that face the same GHG-reduction requirements. Second, it depends on the significance of price competition (Box G). The costs of complying with GHG policies are less likely to reduce competitiveness where firms have established a strong market position by creating high quality, distinctive products. Even within commodity-based industries, some firms have been able to reduce their vulnerability to price competition by building a reputation for providing on-time delivery of high quality products.

Third, it depends on the impact of foreign GHG-reduction policies on the productivity and costs of producers in other countries. Canadian GHG-reduction policies are less likely to reduce industry competitiveness to the extent producers in major competing countries face comparable or more stringent policies; foreign producers are equally exposed to these policies; and they are in an equal or worse position to offset the effects of these policies. Canada's GHG-reduction measures are unlikely to weaken the position of Canadian chemical producers, for example, if U.S. producers face policies that are broadly similar in terms of stringency, flexibility and available support. As was noted in Section C above, a major concern is that this will not be the case, that the burden of GHG reduction will be distributed quite differently within Canada and Canada's major trading partners, especially the U.S.

A final consideration relates to the influence of labour and capital, technology and other productivity determinants on industry competitiveness. Sectors that are strong competitors on the basis of these key underlying determinants will better positioned to withstand any potential adverse impacts of GHG policies. On the other hand, GHG policies may exacerbate the problems facing industries that are already struggling to improve performance so they can respond effectively to foreign competition. Unfortunately, studies suggest that most Canadian industries consist mainly of the latter category of relatively vulnerable performers.

1.6 Principles Which Have Guided the Work of the Industry Table

At the outset, the Industry Table developed five principles which have formed the backdrop to its work relative to the climate change issue[10]:

1. Industry must be part of the climate change effort;

2. Climate change initiatives must support a growing and productive economy which is essential to the quality of life of Canadians;

[10] A fuller description of these principles is contained in Appendix C.

3. Canada must try to make the market work to support efforts to reduce greenhouse gas emissions;

4. Canada must have a level playing field with other countries in terms of trade and competitiveness and must contribute to global solutions; and,

5. Climate change initiatives must aim for sustainable actions which can also lead to the achievement of other environmental/health and economic objectives.

In addition to the framework for assessing competitiveness impacts described in the previous section, The Table has examined a number of technical and policy options through the lens of these five principles. In turn, it wishes to make a number of recommendations which it believes satisfy these principles and which can lead to sound policies that support environmental and economic progress and meet the needs of Canadians.

CHAPTER 2 – KEY THEMES AND MESSAGES

2.1 The size and nature of Canada's climate change challenge must be fully recognized.

From the perspective of the Industry Table, it is critical to understand the nature and size of the challenge which the country faces in attempting to reduce our emissions of greenhouse gases to the level contemplated by the Kyoto Protocol. And it is absolutely essential to appreciate the implications for all Canadians and the substantial changes in consumer lifestyle and expectations that would be entailed.

Canada's GHG emissions are already some 13 percent ahead of 1990 levels (as of 1997). And future projections show this trend continuing up to the Kyoto commitment period, absent major policy interventions. Notwithstanding significant improvements in energy efficiency in a number of sectors, total emissions for the country have increased as the economy has continued to grow and our population has expanded. Indeed, most projections of future emissions growth already anticipate further improvements in energy efficiency in industry.

The most recent updated forecast prepared for the Analysis and Modelling Group shows that the business-as-usual projection for Canada's GHG emissions in 2010 is now some 764 megatonnes of CO_2 equivalent. Our Kyoto target is 565 Mts, making the "gap" 199 Mts, or a 26% reduction. To put the size of this challenge in perspective, the combined current emissions of all sectors represented by the Industry Table is approximately 240 Mts.

GHG emissions are primarily a consumption issue. While Canada is a significant producer of energy, the bulk of our greenhouse gas emissions (80 to 85 percent) arise as a result of the consumption of energy by all segments of society. Thus a strategy to address GHGs will eventually have to focus on, and will have the greatest impact upon, the end-users of energy. Canadian industry is committed to doing its part in reducing greenhouse gases and in many cases is striving to be world-class in energy efficiency. However, as shown in Figure 1 in section 1.2, the sectors represented at the Industry Table represent only 33% of Canadian emissions, and a significant contribution would have to come from other energy consumers and individual Canadians if we are to make any significant attempt to reduce emissions.

Time is relatively short for the significant changes that Kyoto represents. The start of the Kyoto commitment period is less than 10 years away. Given the size of our challenge, even an enhanced use of existing technologies and significantly greater attention to energy efficiency is unlikely to be sufficient. In fact, the target implies energy efficiency gains and other important changes throughout Canadian society of unprecedented proportion. Significant economic restructuring, including development and penetration of major new technologies would be required. So too we would need substantial changes to transportation and urban infrastucture, as well as time for the substantial changes in the existing stock of buildings, vehicles and energy-using equipment. Yet 10 years is too short for such transformation given the lead time that would be required to develop, test and disseminate new technologies and equipment.

2.2 Canadian industry already has made considerable progress in limiting emissions on a voluntary basis, and governments must ensure that the national strategy fully captures the potential of voluntary action.

Through investments in energy efficiency, fuel switching, and changes in product/technology mix, a number of sectors have made considerable progress in reducing the emissions intensity of production over the past decade. The sectors that make up the Canadian Industry Program for Energy Conservation (CIPEC) have in aggregate essentially stabilized their energy-related emissions of carbon dioxide at 1990 levels despite large increases in volumes of production. And the forest industry, largely through substitution of biomass energy for fossil fuels, reduced

emissions by 10% between 1990 and 1997. The chemicals, steel, and forest products industries all expect to meet or better the Kyoto target of –6% on a sector basis. In addition, several companies have chosen to "do the right thing" and reduce their reliance on GHG-intensive processes even where such changes would not be justified solely on economic grounds, for example emissions of nitrous oxide in the production of adipic acid at a major chemical firm, and a dramatic decline in the use of SF_6 in the production of magnesium.

Major industry sectors were the earliest and most enthusiastic supporters of the Voluntary Challenge and Registry (VCR) and Ecogeste, and continue to work to ensure that such voluntary programs can be enhanced and strengthened. Through programs such as CIPEC, VCR and Ecogeste companies and associations strive to build awareness of climate change, to encourage cost-effective action and to report on performance. Voluntary approaches, by their nature, recognize the diversity of industrial circumstances and opportunities and ensure that decisions are made by those who know their operations best. As well, they can help to ensure that environmental actions also enhance the firm's competitiveness and maximize its contribution to Canadian wellbeing in terms of employment and growth.

The marketplace can be a powerful force in changing emissions patterns. The record shows annual improvements in energy efficiency in the range of 1 percent per unit of output for many industry sectors. And this likely will continue to be the case as companies are driven by competitive realities to seek out opportunities to increase yields and lower the costs of production. These energy efficiency and fuel switching investments usually have offered other productivity enhancing benefits, marketplace profile advantages and/or fit with competitive and strategic priorities (for example the move by the forest industry towards a greater use of biofuels). Market forces also work to the benefit of GHG reductions in the case of the intense competition between steel, aluminum and plastics to provide materials that contribute to lighter-weight automobiles. And market dynamics have played a large role in increasing the use of recycled material in the aluminum, steel, newsprint and automobile sectors. The ratio of energy savings is often in the range of five or six to one for recycled as compared to virgin material, and as high as 20:1 in the case of aluminum.

Benchmarking studies show Canadian industry's performance improving compared to other sectors internationally. Many Canadian companies and industrial sectors already engage in comparative benchmarking with counterparts in other countries. Such benchmarking is often key to understanding and maintaining one's competitive position in the world. However, energy efficiency is only one of the factors considered. Comparisons with respect to product design, manufacturing and processing technologies, capacity utilization, labour productivity, etc. would also be part of an overall competitiveness performance appraisal. A number of the sectoral groups have engaged in energy efficiency benchmarking where it makes sense (i.e. industry structure, products and processing technologies are roughly comparable internationally) and data is available. Where Canada is already one of the most efficient producers of a product it makes little sense, environmentally or economically, for climate change policy to encourage the transfer of that production to another location**.**

For the purposes of the Industry Table's work, benchmarking analysis was done for the petroleum refining, chemicals and automobile and auto parts manufacturing sectors. As well, some basis exists for comparative analysis in a number of other sectors (mining, aluminum, and steel). For example, a comparison of national and international data suggests that Canada produces 2% of the world's crude steel but only 1% of the world's GHGs from steelmaking. On the whole, where such comparisons are possible, they show Canadian industry in relatively good shape compared to competitors internationally. A number of the sectors intend to continue using this tool as an aide to assist energy efficiency improvements and as a measure of overall competitive performance.

Energy efficiency investments must compete with other corporate investment priorities. It is clear that industries will always assess new energy uses and production technologies on the basis of their overall contribution to production efficiency and competitiveness and their compatibility

with overall business strategies and priorities. To some extent this involves comparing climate change related investments with other competing uses for limited capital, including new product development, other technology investments, financial assets and acquisitions, etc. But the track record over the last twenty years has demonstrated that for energy intensive industries, energy efficiency investments often do get priority. Potential investments must be judged on a risk/reward basis and, generally speaking, energy efficiency investments offer lower risk profiles and more certain rates of return and may more easily satisfy corporate hurdle rates. However, the situation may be somewhat different for firms where energy does not comprise a significant proportion of costs. For these firms it may be that energy savings alone are not enough to justify the investment, unless it offers other competitiveness enhancing gains.

Canadian industry is committed to further progress on a voluntary basis. Climate change is a societal issue and to make real progress will require sustained commitment by all members of society. Industry will continue to do its part and going forward firms and industries will need to re-double efforts to investigate and implement cost-effective action to reduce the energy intensity of production. Indeed, such efforts are critical to maintaining competitive position. In essence, it is about raising the priority of energy efficiency when firms consider new investments or changes in technology. A number of companies and sectors already have set goals for energy efficiency and/or GHG emissions. Some of these represent "stretch" targets, because goal setting is something industry does to motivate employee action and to stimulate innovation and creative thinking. The CIPEC Board has recently confirmed its intention to seek renewed commitment to an annual energy efficiency improvement of 1 percent per unit of output for the period 2000 to 2005. In order take account of economic growth, goals developed by industry – either to reduce emissions or improve energy efficiency – will have to on a per unit of output basis for the most part. Participants in the Industry Table have discussed the possibility of new voluntary targets related to greenhouse gas emissions. But new voluntary commitments would depend upon a series of factors – including the need to maintain growth and competitiveness, similar undertakings by other sectors and the public, and consistency with efforts on other environmental issues (some of which will cause GHGs to increase).

Governments will need to strengthen the policy framework which supports enhanced voluntary action in order to maximize its potential. Among the more important elements are:

- Clear policy signals and further development of the infrastructure to support voluntary programs;
- Range of financial and non-financial incentives and market enhancement policies;
- Ensure no disadvantage from past voluntary action;
- Recognition for actions that reduce or sequester carbon;
- Technical assistance programs, especially for small and medium sized enterprises.

2.3 The challenge of meeting Canada's Kyoto target is formidable and not likely achievable without major policy interventions and substantial impairment of the Canadian economy.

The various sub-tables have identified a number of cost-effective actions that they are implementing or are interested in pursuing to manage GHG emissions in a way that also allows for reasonable growth and profitability. Nonetheless, their analysis suggests there is not a significant amount of untapped potential remaining or expected between now and the commencement of the Kyoto period (2008-2012), at least in comparison to the scale of reductions represented by the Kyoto target. And while improvements in technology and market dynamics will always produce some new "low hanging fruit", from today's vantage point the scope appears fairly modest. Far from being a "win-win" agenda, the gap between what could be accomplished through enhanced voluntary actions and removal of barriers on the one hand, and what would be required to achieve the Kyoto target, appears significant indeed.

Many companies and sectors have seen dramatic increases in production and exports since 1990, which have contributed to Canada's economic success in the latter part of this decade but also have increased levels of GHGs. And some of the more sizeable reductions in GHG emissions occurred or are occurring largely as a result of one-time events (e.g. major process changes in the production of adipic acid and magnesium) and/or special circumstances, rather than representing examples that could be easily replicated.

Kyoto represents some economic opportunities, but also poses significant risks to Canadian competitiveness. The Table is conscious of the fact that Canada has a number of products and capabilities that could produce economic benefits if the international community moves to address emissions reduction in a serious way. Innovative, climate-friendly technologies may provide a source of comparative advantage for Canada in selected areas, and undoubtedly we should try to position ourselves to take maximum advantage of both the domestic and export opportunities in these areas. From an industry wide perspective however, the Table is concerned that these opportunities may be comparatively small compared to the risks faced by a significant cross-section of Canadian industry if Canada moves to implement the Kyoto target.

From the perspective of the Industry Table, significant reductions in energy-related emissions can only be realized by government intervention to restrict energy use and so constrain Canadian economic growth. Fundamentally, our Kyoto commitment represents a fixed limit on the use of carbon energy as an economic input and thus imposes a serious constraint on the character of our future economic performance.

Canadian industry will continue to require electric and oil and gas energy for the foreseeable future. Policy decisions to address climate change must be carefully designed so as to not disadvantage Canadian industry's ability to obtain economical and reliable electricity and oil and gas supplies.

Studies done in some sectors (petroleum products, upstream oil and gas, chemicals, transportation equipment) suggest that energy taxes or mandatory emissions trading, while technically effective in reaching a mandated level of emissions, would do so at substantial cost to Canadian investment and competitiveness. This would be especially so if Canada were to undertake such measures unilaterally and put us out of step with our trading partners. As illustrated by the analysis done on polyethylene plants, investment in what is now a highly productive and globally competitive Canadian industry could easily dry up if Canadian policy gets seriously out of line with our major competitors. As the studies in the upstream oil and gas and petroleum refining sectors have shown, the short term consequences for Canada of using less than our full economic capacity would be significant and extend beyond those sectors alone.

2.4 Fundamentally, climate change policy must be integrated within an overall public policy framework that supports a productive, innovative and competitive economy and that can help achieve broad societal goals.

Canada faces considerable challenges as we seek to enhance our position in a highly competitive global marketplace, and to maintain our number one ranking in the United Nations' Human Development Index. Federal and provincial governments have identified a number of key priorities related to improving productivity, enhancing innovation, fostering investment and entrepreneurship, improving our trade performance and growing our economy.

Canada is a trading nation and is by far the most open of the G-7 economies – our trade in goods and services makes up almost 75 percent of Canadian GDP. The wealth generated by exports and by a growing economy supports Canada's high standard of living, as well as providing the resources to address environmental issues, and the capacity to invest in new and less GHG-intensive technologies. On the other hand, a fragile economy with limited innovation and low productivity growth would hamper our ability to respond effectively to the climate change challenge.

Resource-intensive industries are among the most important contributors to our economic and export performance, and yet they are also among the most vulnerable to the impact of climate change policies. Moreover, since energy is such an important facet of our economic and personal lives, the response to climate change will have broad implications for all Canadians. Our resource endowment, energy supply and industrial base varies from one region of the country to another. Accordingly, climate change policy must be situated within the broader societal policy framework that supports a growing and productive economy and is consistent with other government priorities related to regional development, enhancing employment, fiscal balance, health care, etc.

Maintenance of a sound fiscal framework is essential. Any tax or fiscal measures that are introduced to accelerate climate change action must be situated within an overall framework that is consistent with the broad fiscal and economic direction for the country. It is important that such measures not detract from the needed focus on tax reform and reducing the burden of taxation on Canadian business and individual Canadians. These latter policies will be critical to enhancing economic performance, sustaining investment and improving productivity and competitiveness.

Another critical element of the framework is a technology policy that is appropriate to Canada's industrial circumstances. It would be easy to say that a more rapid development of lower emission technologies is the key to tackling climate change. However, it must be recognized that merely placing our faith in technology will not produce the "silver bullet" that gets Canada or the world to the Kyoto objective. The reality is that the start of the Kyoto commitment period is less than ten years away. The lead times required for development, testing, gearing up to commercial production and reasonably broad dissemination of new technologies can be at least that long. Accordingly, for technologies to help meet Kyoto commitments most would already have to be known.

Nor is it clear, that climate change represents a technology "winner" for Canada. While Canada has a few well-known examples of leading edge technologies in this field, many of our energy-intensive industries traditionally have been importers and adapters of technology, rather than innovators and developers. Technology policy related to climate change must recognize this reality. A conducive climate for innovation in Canadian industry is essential, so that Canadian firms can play their part in the development of new, climate-friendly technologies. However, equal attention must be paid to policies that can assist companies with access to and deployment of potentially costly new technologies.

The interrelationship among trade, competitiveness and climate change policy must be a priority for the federal government going forward. As a nation that relies on trade for a larger percentage of its GDP than almost any other developed nation, consistency with the WTO and the rules of the international trading system is critical. We must ensure that policies continue to support export-oriented industries to be environmentally sensitive and efficient competitors internationally and that they contribute to maintaining Canada's comparative advantage as an exporter of energy and resource intensive goods.

Small and medium-sized enterprises pose a special challenge for climate change policy. Small and medium sized enterprises (SMEs) – usually defined as those with between 5 and 500 employees – represent about 32,000 companies across Canada. Generally, they tend not to be heavy users of energy – only 2-4% of their total production costs are energy expenditures. Nonetheless they will be an important component of a national strategy to address climate change. Inclusion of SMEs in GHG reduction activities will pose a unique set of challenges. They may not be as focused on the need to improve energy efficiency as large companies in resource and manufacturing industries, nor have the same capacity to invest in new technology. Access to capital and profit margins are often lower or more volatile, and even more so than the large enterprises they will have other priorities for investment dollars and likely require a shorter pay-back period for investments in energy efficiency.

The SMEs sub-table looked at two key sets of initiatives that could enhance SME efforts to control emissions: 1) better coordination of government programs at various levels aimed at improving energy efficiency; and 2) how larger companies might influence their SME suppliers to focus more attention on GHG emissions. A summary of the main recommendations in this area can be found in chapter 3.

2.5 Further development of the national strategy must proceed on the basis of sound fundamentals for decision-making and appropriate timing.

At this point in time, there are still considerable risks and uncertainties related to an appropriate climate change strategy for Canada. The science is uncertain, and may eventually suggest greater or lesser action or indeed more attention to adaptation strategies. We have only partial understanding of the risks that climate change may pose to vulnerable ecosystems in Canada. Despite considerable effort, we have yet to amass the quantity and quality of information that would allow us to fully assess the costs and benefits of implementing Kyoto and to judge the most effective means to reduce emissions of greenhouse gases. An overemphasis on climate change solutions may put at risk other societal goals related to economic and social progress. And we know very little about the actions that our trading partners and competitors may take and even if they are truly committed to ratification of the Kyoto Protocol.

Climate change is a risk that calls for a prudent, risk-management approach. From the perspective of the Industry Table, this suggests some key principles that should guide development of the national strategy related to ensuring a sound basis for decision-making and in the timing of key decisions.

A sound basis for decision-making includes:
- Comprehensive micro and macro assessment of the costs and benefits of Kyoto;
- Thorough cost-benefit analysis of individual measures;
- Consistency with other environmental, social and economic goals;
- Clear delineation of federal and provincial responsibilities;
- Participation and engagement of all Canadians.

Timing of key policy decisions must be consistent with:
- Advances in the science,
- Clarification of international rules;
- Actions of our major trading partners and competitors;
- Broader international participation in reduction commitments;
- Pace of technological development and capital stock turnover.

Canadian priorities should include:
- Maximizing cost-effective opportunities with multiple benefits;
- Creating the conditions for sustainable, longer term change;
- Investments that contribute to furthering of the science and potential adaptation strategies;
- Gaining a better understanding of Canada's strengths and vulnerabilities;
- Ensuring no undue burden on any region or sector;
- Maintaining and enhancing our ability to compete internationally.

2.6 Canada's negotiating strategy internationally must reflect our trade and economic interests.

It has become apparent that climate change is as much an economic and trade issue as it is an environmental issue. That is reflected in how various countries positioned themselves in the development of the Kyoto Protocol and how they now conduct themselves in the ongoing international negotiations. Canada can do much on the diplomatic stage to encourage broader international participation in climate change efforts and in forging a long-term, sustainable global strategy. But Canada has its own interests -- environmental, economic, social, trade and

competitiveness -- and our positions internationally must reflect that reality. Canada is only 2% of the problem and we could do relatively little to provide a global solution on our own. For the reasons noted elsewhere in this paper, the Industry Table is concerned that we could do serious harm to our economy if we move precipitously to address the issue in the absence of corresponding, demonstrated action by the international community.

In particular, policies must reflect the reality of North American economic integration. The closer integration of the Canadian and American economies is a reality that will only intensify over the period contemplated by the Kyoto Protocol. This has enormous implications for the policy choices that the country makes in developing a national climate change strategy, and underlines the importance of ensuring that we do not inadvertently place ourselves at a comparative disadvantage to our most important trading partner.

The United States produces 25 percent of the world's GHG emissions (and 34 percent of Annex I emissions). Not only are their actions critical to the realization of any real global progress on GHG reductions, but it is doubtful whether many other countries will ratify the Kyoto Protocol unless the US first signals its intention to do so. Just as in a trade context, this gives them enormous power in influencing the rules internationally, in setting the policy parameters for action and in securing access to low-cost reduction opportunities internationally. Canada, on the other hand, with just 2 percent of global emissions, can do little on its own to arrest the trend of growing global emissions. But as a small and open economy highly reliant on trade we will be significantly impacted by the actions and policy choices of our trading partners and competitors, most particularly the United States.

At first glance, the targets agreed to in Kyoto by the two countries may appear to be relatively equal (-7% for the U.S. versus –6% for Canada). In fact there are a number of reasons to think that Canada's target may prove to be more onerous:

- The Canadian economy is more energy intensive than our neighbour's, and more reliant on energy and energy-intensive goods for our national wealth.
- Canada is more dependent on trade, such that in a Kyoto world we will be impacted not only by our own domestic policies but also by a likely reduction in the demand for our products internationally.
- The economic advantage relative to the development and export of new lower emissions technologies is likely to be much greater for the United States than is the case in Canada, where traditionally we have been buyers of technology.
- Electricity production is more fossil-intensive in the United States (60% fossil versus 22% in Canada) and electricity sector emissions make up a much greater proportion of the US inventory than in Canada (54% versus 17%). Accordingly, the US may be able to achieve a significant portion of its target through lessening the carbon intensity of its electricity production, resulting in a lower impact to the US economy compared to Canada, and a reduced burden on American industry relative to their Canadian counterparts.

Canada should seek broader international participation in reduction commitments, so that our efforts are not supplanted by increased emissions elsewhere. Many developing countries have no commitments and yet a number of them already compete with Canada in a range of industries (e.g. oil and gas, metal smelting, aluminum, steel, automobiles, forest products, chemicals, fertilizers, etc.) As well, countries of the former Soviet Bloc have taken on targets that will be relatively easy for them to reach given their economic decline since 1990, and they will be looking to expand their production in a number of energy-intensive industries that will compete directly with Canadian firms. And of course Mexico is now a partner in NAFTA but has no commitment under the Kyoto Protocol. Climate change initiatives that put companies in Canada at a competitive disadvantage with Mexico could simply shift the plants to Mexico along with the emissions. Nor is it strictly a question of wholesale transfer of a production facility. For example, there currently is global overcapacity in automobile manufacturing and an increase in production costs in some jurisdictions could simply shift market share to firms in developing countries. This would not reduce global emissions and might even increase them if these

countries produce goods less efficiently than they are manufactured in Canada. Accordingly, to avoid this problem of "carbon leakage", Canadian governments should ensure that domestic policies do not inadvertently give a competitive edge to a less efficient producer elsewhere in the world. And the federal government should place a high priority on the participation of developing countries in future reduction efforts as part of its international negotiation strategy in the lead up to COP-6.

CHAPTER 3 – SUMMARIES OF SUB-TABLE REPORTS

3.1 Upstream Oil and Gas Sub-Table

Context

There is currently considerable uncertainty about international agreements, what will be done in other countries and what would be appropriate reduction objectives and policies in Canada. Nevertheless, the oil and gas industry is committed to positive action to reduce GHG emissions through the application of new technology that improves energy efficiency and reduces fugitive emissions.

Even in a scenario of global constraints on GHG emissions, oil and natural gas will continue to be the dominant contributors to global energy supply, well past 2010.

Growth of Canadian oil and natural gas production provides both a major economic opportunity and a secure alternative to OPEC oil as an energy supply to North America. The economic benefits of this opportunity derive from regional developments on the east coast, the north and the prairies, but are spread out across Canada.

Key Messages

1. Canada's economic and GHG emission situation is very different from that of the United States and most other industrial countries.
2. GHG emissions are primarily an end-use consumption issue.
3. The climate change issue generally and the Kyoto Protocol in particular, presents a major uncertainty that could undermine Canadian oil and natural gas development opportunities.
4. Canada should not be penalized by its growth of oil and natural gas exports.
5. The ability to reduce emissions by changing production technology is limited. Large reductions in Canadian upstream emissions would require a shift of production to other countries, which would do nothing to reduce global emissions.
6. In the near term, Canada should focus on promoting cost-effective action, R&D and international flexibility, and ensure that companies that reduce emissions receive recognition.

Policy Phases in the Face of Uncertainty and Near-term Measures

Given the uncertainty around the climate change issue and the nature and extent of other countries' commitments to reduce GHG emissions, Canada should adopt a phased approach to climate change policy measures.

1. The first phase covers the period from now until there is relative certainty about what actions the U.S. and other countries will take. Policy efforts should focus on proactive near-term measures:
   - Enhanced voluntary action program that would have three main elements:
     - Reliance on individual corporate decisions regarding minimizing costs and managing the risks of future climate change policy.
     - Baseline protection.
     - An enhanced Voluntary Challenge and Registry (VCR) that could build on the reductions achieved to date and also fill a role of registering actions for baseline protection and communication of opportunities among companies.
   - Enhanced corporate involvement in employee and public outreach programs to promote consumer awareness and individual actions to conserve and use energy efficiently.
   - Removal of regulatory barriers or other impediments to actions that would reduce emissions. One example would be the removal of restrictions that prevent the sale of

excess, self-generated power to other industrial users. This is relevant for cogeneration projects and well-site generation of electricity from otherwise flared gas.
- Enhanced government and industry support for research, development and demonstration. RD&D support of low emissions technologies would help Canadian industries to be at the leading edge of energy and emission intensity of production.
- Recognition of pre-commitment period actions. Beyond baseline protection, the particular form of recognition should evolve in light of international developments.
- Logistical support and pilot level incentives for participation by Canadian companies in foreign offset and domestic sink enhancement projects.

2. The second phase would run from the time of clarity about what actions other countries are committed to take until the beginning of the period of commitment to take actions. Policy efforts should focus on:
   - Further promoting public awareness and acceptance of the policies required to meet Canada's commitments;
   - Providing certainty about commitment period policies, including Canadian access to international flexibility mechanisms, to allow individual decision makers to prepare in the least cost way to respond to those policies and make optimum use of all available measures; and
   - Building the institutional structure required to implement the policies, including the system of emission monitoring and reporting.

3. The third phase would coincide with the international commitment period. In this phase the focus would be on:
   - Carrying out policies; and
   - Preparation for further developments in international climate change policy.

Analysis for Phase 2 Decisions on Commitment Period Measures

Reducing oil production in Canada and supplying Canadian and U.S. markets from other sources would reduce emissions in Canada, but it would not reduce global emissions. Imposing costs on the upstream industry through taxes, tradable permits or mandatory limits would be costly and counter-productive, unless matching measures were adopted in all significant competing supply basins. If measures cause deterioration in the competitive position of the Canadian industry, production would shift from Canada to other countries, with losses of investment, income, jobs, exports, and government revenue, and no reduction in global GHG emissions. This reality must be reflected in the analysis of and decisions on commitment period measures.

Potential Commitment Period Measures

1. International Emissions Trading
   Minimizing costs of global emission reductions requires an effective and efficient method of national emissions targets, international emissions trading could be an effective method to do this. Analysis for decisions on commitment period measures needs to address how to make international emissions trading work well for Canadian companies.

2. Domestic Emissions Trading
   While pricing of emissions through domestic emissions trading is viewed by many people as the most efficient method of reducing emissions to some target level, the acceptability of a domestic emissions trading system depends critically on:
   - the target itself;
   - the allocation of emission rights in the form of baselines or permit allocations; and
   - the linking of domestic emissions trading to international emissions trading, as part of comprehensive international agreements.

If the National Climate Change Process identifies emissions trading as a cross-cutting measure worth evaluation, it is important to understand the competitive impacts of various options of domestic commitment period emission trading under different assumptions about the permit allocation methods.

3. Negotiated Performance Standards
   Industries such as oil and gas that compete in global markets dominated by suppliers from non-Annex B countries cannot bear significant costs to reduce their emissions intensity without serious erosion of competitiveness. The policy challenge for a commitment period is to ensure that such industries pursue cost-effective measures that recognize the turnover of their existing capital stock and do not undermine their international competitive position.

Upstream Emission Reduction Cost Analysis

Clearstone Engineering Ltd analyzed the net specific costs to achieve different levels of emission reductions based on a set of identified technologies and the estimated practical penetration level for each of them. While the analysis involved simplifications and limited scope, it is believed to provide a reasonable first estimate of actual emission reduction costs and potential. Implementation of the actions costing up to $10/tonne of CO2 would result in an emission reduction of roughly 6 MT CO2 per year. For costs up to $35/tonne, the reduction is estimated to be 13 Mt. Thus, while emission intensity of production could be reduced further at considerable cost, such reductions would be more than offset by increases in production to date and projected.

Charles River Associates Analysis of the Impact on the Oil and Gas Industry of the World Implementing the Kyoto Protocol

As previous studies have shown, the overall impact and cost of reducing global emissions as anticipated in the Kyoto Protocol is significantly lower if international emission trading enables the reductions to be made where they are lowest cost.

The distribution of the overall impact of GHG emission constraints can vary dramatically depending on the specifics of the policies used in Canada and other Annex B countries to meet their target emission levels. In particular, the relative treatment in Annex B countries of upstream emissions of Annex B oil production and imports of non-Annex B oil would determine the effect of constraints on the competitiveness of the industry in Annex B and the degree of shifting of production and sources of supply to non-Annex B countries. Equal treatment would avoid a major shift of production from Canada to non-Annex B, with the Canadian oil and gas industry suffering roughly the same negative impact as non-Annex B suppliers.

The degree of fuel switching in U.S. electricity generation has a significant effect on the U.S. demand for Canadian natural gas and therefore on the effect on natural gas production of GHG emission constraints.

Upstream Emissions, Exports and Canada's GHG Emissions Inventory

Canadian upstream oil and natural gas emissions associated with exports are, quantitatively and qualitatively, an important example of the logical problems with the target approach of the Kyoto Protocol. Of the 155 M tonne increase in projected emissions from 1990 to 2010 under business as usual, 32 M tonnes arise from upstream emissions associated with projected increases in net exports of oil and natural gas. Relocating emission intensive production among countries will change those countries' national emission inventories but not global emissions. The quantitative significance of the growth in Canadian natural gas and oil exports warrants an adjustment in Canada's inventory. This has consistently been identified by Canada's Minister of Natural Resources as an unresolved Canadian issue with the Kyoto Protocol. Canada should follow the precedent set by Denmark in reporting inventories normalized for changes in energy exchanges with its neighbours.

3.2 Petroleum Refining Sub-Table

This report was prepared to address the implications on the Canadian refining industry of reducing greenhouse gas emissions (GHG) to meet Canada's proposed commitment to the Kyoto Protocol. Specifically, a plant-level analysis of costs and benefits was prepared, and the economic and competitiveness impacts on the industry were assessed.

Of the Canadian CO_2 emissions attributed to petroleum products, less than 10% are generated by the refining industry, compared to over 90% from end-use consumption of refined petroleum products. The Canadian refining industry has improved its energy efficiency since 1990, in response to competitive pressures to reduce operating costs. CO_2 emissions from the refining sector in 1990 were 18.3 megatonnes, and have remained nearly constant since that time despite higher production rates.

The Canadian refining industry faces considerable investments between 2000 and 2010 in order to meet mandated reductions in sulphur in gasoline and diesel fuel. These investments will result in an increase of CO_2 emissions over 1990 levels by around 22% in 2010, in the absence of any specific initiatives to reduce energy consumption and GHG emissions.

The refining industry output is determined by the market demand for petroleum products and the volume of imports entering the Canadian market. This study utilized a demand outlook prepared by Natural Resources Canada which appears to be quite conservative. Based on a higher demand outlook which is more consistent with recent historical demand rates, the refining industry CO_2 emissions could be as much as 38% above 1990 levels by 2010. Achieving a 6% reduction below 1990 levels from this alternative Business-as-Usual (BAU) case will be a very difficult target, unless refinery shutdowns occur. Higher imports would be required to meet Canada's petroleum product demand, leaving total CO_2 emissions almost unchanged.

SNC-Lavalin prepared a detailed analysis of steps that the refining industry could take to reduce energy consumption and GHG emissions. A range of options was evaluated, and reviewed with a group of participating refiners. Projects are classified as noted below. The low capital or operating efficiency projects have the potential to be economically viable projects. With the exception of cogeneration projects, the rest are marginal or uneconomic.

- Low capital, operating efficiency projects (e.g. stripping steam reduction)
- Medium capital, process/utility optimization projects (e.g. boiler efficiency improvement)
- High capital, refinery specific projects (e.g. reformer conversion to CCR, cogeneration)
- High operating cost, GHG projects (e.g. liquid fuel replacement with natural gas).

The economic analysis in this report is based on a reduction of end-user emissions from petroleum products to 6% below 1990 levels. Without further measures to improve energy efficiency in refineries, and assuming product imports and exports remain at historical levels, refinery CO_2 emissions should increase to 22.4 megatonnes in 2010, a 22.5% increase over 1990 levels for the Business-as-Usual Case. The Kyoto Case would have emissions of between 18.2 and 19.8 megatonnes of CO_2 by 2010, due to a reduction in petroleum product demand. This is equal to or slightly above the 1990 level. Implementation of economically feasible energy efficiency projects should provide a further reduction of 0.3 to 1.1 megatonnes of CO_2.

The economic impact of the Kyoto initiative on the Canadian refining industry is expected to be severe. Assuming that petroleum product demand in the industrialized Annex 1 countries is reduced to meet an emissions level of 6 or 7% below 1990, there will be a significant amount of surplus refining capacity in the market. This is expected to reduce refining margins such that a number of refineries (including some in Canada) will be forced to shut down. Our assessment is that three or four refineries in Canada could close under the Kyoto initiative. This is in addition to three refineries which are vulnerable to be shut down due to the gasoline sulphur reduction investments which need to be made prior to 2005. Incorporating Kyoto shutdowns, emissions could be reduced to 18 megatonnes of CO_2, or about 2% less than in 1990. In order to reach an

emissions level of 6% below 1990, the industry would therefore need to implement a number of projects which are marginal or uneconomic.

In the Kyoto environment, Canadian refineries will find it difficult to attract the necessary capital to add further investment for GHG reductions. The energy efficiency projects defined by SNC-Lavalin were evaluated under several policy initiatives including accelerated depreciation and a $200 per tonne carbon tax. An accelerated depreciation policy would lower the hurdle rate for refinery investments, and emissions would be expected to be reduced to 4% below 1990 levels based on no further shutdowns of refinery capacity.

However, a carbon tax would likely penalize the Canadian refining industry to a greater degree than its U.S. competitors. A carbon tax penalizes a cracking refinery more than a coking refinery. Cracking refineries produce residual products, whereas coking refineries destroy the residual products. Only a few Canadian refineries have cokers, and are generally closer to the cracking refinery configuration than U.S. refineries. Thus, a carbon tax would provide further uncertainty and risk to the Canadian industry, such that a refiner in Canada might not be able to justify investments to reduce emissions. For this reason, we do not believe that a carbon tax would provide the necessary incentive to achieve substantial further reductions in CO_2 emissions from the majority of the Canadian industry.

In our opinion, the Canadian refining industry could not meet a pro-rata Kyoto GHG reduction target through implementation of economically attractive energy efficiency projects. The Kyoto environment is likely to result in plant shutdowns. The current challenging economic environment would be made more difficult by pressure to rationalize, if petroleum demand is reduced by Kyoto programs. This would likely result in more refinery closures, rather than the industry making significant investments which would be very difficult to recover. Exporting emissions to developing countries, and relying more on imported products, appears to be the most likely outcome for the Canadian refining industry if the Kyoto Protocol is implemented such that the refining industry must reduce its own emissions by 6% below 1990 levels.

3.3 Industrial Chemicals & Synthetic Resins Sub-Table

The purpose of this paper covering the Industrial Chemicals and Synthetic Resins sector, as represented by the members of the Canadian Chemical Producers' Association (CCPA), is to describe the impact of various options for reducing greenhouse gas (GHG) emissions and for improving energy efficiency. This paper is built on the ICSR Foundation Paper and does not repeat information that provides insights into the nature of our sector.

A significant portion of the study is based on analysis of a survey of CCPA members that make up over 95% of the GHG emissions of the sector. While this analysis does not provide a detailed quantitative assessment of policy options, we believe that our quantitative and qualitative results provide an appropriate indication of the practicality and impact of various policy options to address GHG emissions for our sector.

Another significant portion of the study results is based on the use of an internal CCPA model that describes the relative competitiveness of polyethylene plant investments in various parts of North America through the comparison of fixed and variable costs, such as raw materials, energy, transportation, and labour costs, capital and construction costs, and all taxes. This model has been in use for several years by the sector to predict economic results and has been validated with actual economic performance. The model was used to estimate the potential impact of mandating either carbon taxes on fossil-fuel use or emissions trading on the competitiveness of the sector.

The Canadian Chemical Producers' Association established the ethic of Responsible Care® in 1985 and it is recognized as the leading and most rigorous industry responsibility initiative by an industry sector in the world. Member companies are committed to working hard to continuously

reduce emissions that negatively impact on the environment and human health. Since 1992, when CCPA members started the first public reporting by an industry sector of emissions, member companies have focused on those emissions that are of the highest concern and impact, and those where the sector is a high contributor compared to others. For our sector and companies, investments or measures to reduce emissions must always be considered in the context of the overall efforts to improve the environment. Reduction of greenhouse gas (GHG) emissions, both in terms of global warming potential (GWP) of emissions and emissions per unit of output is one of many areas in which our members are active. CCPA member companies make up 90% of the output of the Industrial Chemicals & Synthetic Resins sector.

For the CCPA members, the estimated projection to 2010 for Global Warming Potential of greenhouse gas emissions is 21 to 27% below the 1992 base year. This includes CO_2, N_2O, and CH_4 measured as CO_2 equivalent. Using 1992 as the base year results from the beginning of collecting accurate data on GHG emissions, and provides a conservative estimate as 1990 was a higher production year.

The estimated projection for CO_2 emissions only to 2010 is for an increase of 31 to 42% above 1992 levels, largely due to expected increases in production and the application of state-of-the-art co-generation technology, since the co-generation application moves emissions from electricity generation to "direct" emissions. Through energy efficiency improvements the CO_2 emissions per unit of output is expected to improve between 29 and 32%.

Continued progress has been made in improving energy efficiency. Improvements in energy efficiency per unit of production are expected to be 1 to 2%/year. No major processing technology gaps have been identified, based on the state of current technology. Changes in fiscal policy to provide incentives to invest in new technologies to reduce GHG emissions are, therefore, unlikely to make a significant difference in the sector's GHG emissions performance. However, investigation of incentives to encourage investment should continue.

In the ICSR sector significant growth has already occurred in the application of co-generation technology and further significant growth is expected to continue to 2010. While current reporting techniques imply that this will significantly increase direct emissions from the sector, the offsetting decrease in GHG emissions associated with less dependency of the sector on non-co-generation sources will be larger, resulting in an overall GHG emissions reduction for the sector on a unit of output basis.

Emissions trading for CO_2 based on a carbon emissions cap or carbon taxes on fossil fuel use has been calculated, using a CCPA model of a polyethylene plant, to have a significant negative effect on competitiveness of the ICSR sector as compared to jurisdictions that do not adopt equivalent fiscal measures. Model results show that the impact of a carbon tax of US$ 50,100 and 200/tonne, applied to the energy consumed to produce ethylene feedstock alone, would reduce the internal rate of return (IRR) by 1.2, 2.4 and 4.9 points, respectively, an amount that would encourage investment outside of Canada.

Chemical industry growth and development is required to sustain competitiveness and improve energy efficiency. The output of this sector is used broadly within industry to competitively displace more energy intensive materials and assists downstream consumers operate in a more efficient manner.

3.4. Minerals and Metals Sub-Table

3.4.1 Aluminum Sector

Canada is the world's third largest producer of aluminum, accounting for 11% of global production. By 2010 Canada's production is expected to double, to more than 3 million tonnes per year; by 2020 it will increase to almost 4 million tonnes per year. Aluminum production is

relatively high in greenhouse gas intensity. In 1990, Canadian producers emitted 10 million tonnes per year of CO2 and equivalent, corresponding to a GHG intensity of 6.4 tonnes of CO_2 equivalent per tonne of aluminum. In the year 2000, the industry projects, on a business as usual basis, that Canadian producers will emit 10.7 million tonnes per year of CO_2 and equivalent (production having increased by 60 percent), corresponding to a GHG intensity of 4.2 tonnes of CO_2 equivalent per tonne of aluminum. By world standards this intensity is low, partly because much of Canada's production is based on hydro-electricity, which has very low associated GHG emissions, and partly because Canadian plants are generally modern, with technology that is relatively GHG friendly.

Canada's modern production facilities contribute to the strong competitive global position that Canadian aluminum enjoys. One concern over actions and measures to reduce GHG emissions is that, if not applied judiciously, they could adversely affect this position. In extremes, Canada could lose production to countries whose facilities are inherently less GHG-friendly than Canada's, with the dual result that Canada would lose industrial production and employment, while global GHG emissions would increase.

GHG emissions arise in aluminum production from three sources. One, accounting for about 1.1 million tpy of CO_2 emissions, is the use of fossil fuels for some process operations. The second is the conversion to CO_2 of the carbon anodes used in the electrolysis of alumina; this accounts for about 4.5 million tpy of CO_2. The balance of 5.5 million tpy is emitted in the form of perfluorocarbons (PFCs), which are particularly potent GHGs. These emissions arise intermittently when electrolytic operating conditions inevitably vary from optimal.

Under a "Business as Usual" scenario, the Aluminum Association of Canada estimates that GHG emissions from aluminum production will rise over 1990 levels by 18% by 2010, and by 30% by 2020. This BAU scenario assumes some reduction in fossil fuel use and in PFC emissions. It differs from the corresponding forecast in Canada's Energy Outlook 1996-2020. The difference arises from different forecasts of growth in aluminum production, and from different estimates of PFC emissions from operations. PFC emissions are very difficult to measure accurately, and the Aluminum Association of Canada intends to develop better estimates of PFC emission factors. The BAU forecast for GHG emissions may well be revised when these improved factors are available.

There are three sets of actions that could reduce GHG emissions below the BAU forecast. First, new control and monitor systems at some operations could reduce PFC emissions, at a cost of $4.5 to $7.5 million per smelter. These systems could reduce CO_2 equivalent emissions by 0.8 million tpy by 2010. Second, installing point breaker feeders where appropriate could further reduce PFC emissions by 0.9 million tpy of CO2 equivalent. The cost would be in the order of $200 million per smelter. Third, the BAU case assumes that older technology at some smelters will be phased out by 2015. If these older facilities were shut down prematurely as soon as is technically possible, GHG emissions would be reduced by 2010 by 0.8 million tpy of CO2 equivalent. However, the cost is estimated to be $1.36 billion, and there is no likely scenario under which the industry would make such an investment before the plants involved have reached the end of their normal operating life.

Assuming that measures were in place to encourage the first two sets of actions, GHG emissions from aluminum production in Canada in 2010 would be about 10.2 million tpy of CO2 equivalent, or about 2% above 1990 levels. Because production by 2010 will be about twice that of 1990, the GHG intensity will have approximately halved in that period.

Measures that the industry would support to achieve these reductions include *Credit for Early Action* combined with a binding *Covenant*, in which the industry would commit to voluntary improvement in GHG intensity in return for a government commitment not to introduce mandatory measures. A redesigned *Capital Cost Allowance*, provided it did not bring the threat of countervail actions, would also be supported. The industry does not support *Direct Subsidies*, in part because they may attract countervail actions. A *Carbon Tax* would be opposed, and a

Cap and Allowance strongly opposed, by the industry, because both would erode the industry's competitive position internationally.

There are two important "indirect" ways in which the aluminum industry can contribute further to achieving GHG reductions. One is through enhanced recycling. Aluminum can be recycled indefinitely; it essentially does not degrade in use and in re-processing. Processing of recycled aluminum uses a fraction of the energy required to process virgin material, and has no associated PFC emissions. The industry would strongly support measures that *Encourage Recycling of Aluminum.*

The second way is through reducing the weight of vehicles. It is estimated that optimal use of aluminum in automobiles would reduce the weight of a typical vehicle by 40%, with an associated reduction in fuel consumption in the order of 20% or more. These fuel savings would translate directly into reduced emissions of CO_2. As combustion of fossil fuels for transportation is the largest single source of GHGs, the potential reduction from lightweighting vehicles would far exceed any savings made through improvements in processing aluminum. The industry would strongly encourage policies that encourage the effective use of materials or products that would reduce the emission of greenhouse gases.

3.4.2 Cement and Concrete

Concrete is an essential material in construction, and its use is projected to grow significantly in future. Associated GHG emissions are projected to increase from 10.5 million tonnes in 1990 to almost 14 million tonnes in 2010. Over half these amounts are the non-energy related emissions of CO_2 resulting from the conversion of limestone to lime, which is an essential step in manufacturing cement. Much of the rest is emitted from combustion of fossil fuels to generate the heat required to convert limestone to lime.

The Canadian cement and concrete industry has an excellent record of improving energy efficiency, and there are few easy gains remaining. However, there are three areas in which reductions in GHG emissions can be made. These are: improvements in energy efficiency and fuel use; increased use of concrete where it can be shown to result in a net reduction in GHG emissions; and partial replacement of cement by supplementary cementing materials that involve no additional generation of GHGs. Actions in these areas can yield an estimated reduction in CO_2 emissions of almost 7 million tonnes in 2010. Three measures are proposed to realise these benefits:

- Encouraging replacement of fossil fuels by otherwise waste materials, at a total cost of $0.5 million
- Encouraging increased use of concrete in constructing houses and roads, at a total cost of $6.9 million
- Encouraging increased use of supplementary cementing materials, at a total cost of $2.1 million

The cement and concrete industry would not support measures, such as a carbon or energy tax, that increase the cost of doing business, particularly if such measures were introduced without regard for complementary measures in other nations. The cement producers in particular depend upon the export market, and any measures that reduced their competitive position could jeopardise the health of the entire industry.

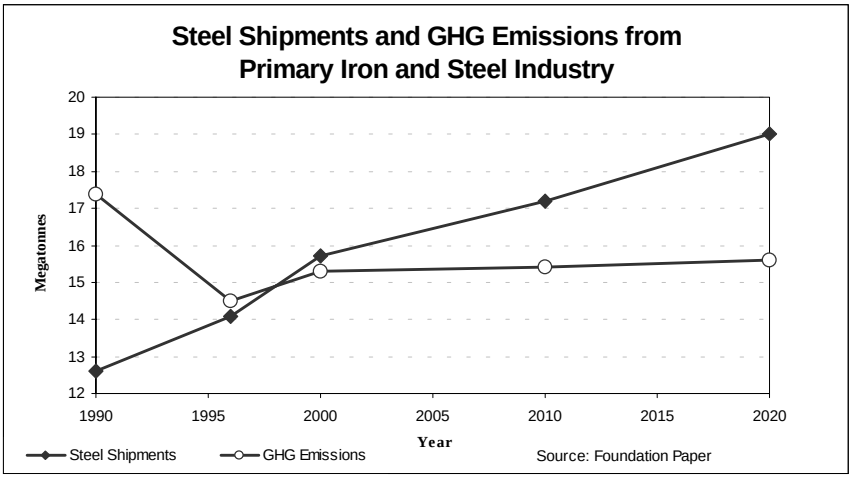
3.4.3 Iron and Steel Industry

Canadian steelmakers are among the most energy efficient in the world, which has contributed to positive results in greenhouse gas emission reductions. In 1995, Canada accounted for 2% of total world production of crude steel (14th largest producer of crude steel), but only 1.1% of total

carbon dioxide emissions from steelmaking.[11] This high level of performance is a direct result of improved production efficiency and extensive use of electric arc furnaces. The iron and steel industry has completed both a *Foundation Pape*r and a *Preliminary Analysis of Actions and Opportunities for GHG Mitigation* and is currently completing an *Options Paper* that will detail the industry's ability to reduce GHG emissions given various GHG mitigative policies.

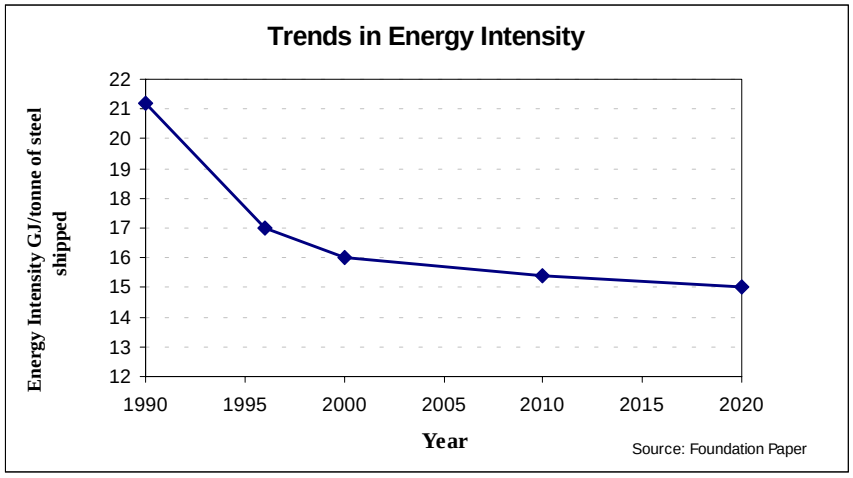
The Iron and Steel Industry and Climate Change

By 1996 the Primary Iron and Steel industry had reduced its GHG emissions to 2.9Mt below 1990 levels[12] (i.e. 16% below 1990 levels). By 2010 the Steel industry expects production in Canada to be 37% higher than 1990 levels. The industry is, however, expected to emit 12% fewer emissions in 2010 than 1990. The following figure depicts historic and expected shipments and GHG emission from the primary iron and steel industry.



The achievement of these reductions in GHG emissions can be attributed to the substantial increases in energy efficiency that the industry has achieved since 1990. These decreases in energy intensity can be attributed to two significant factors (1) the virtual universal adoption of the continuous casting process and (2) the growth of the mini-mill sector, that has a much lower energy intensity than integrated production. The following figure shows the significant decreases in energy intensity the industry has achieved to date and is expected to achieve in the future.

11 CSPA calculation from International Iron and Steel Institute figures for Canadian and international crude steel production and international CO_2 emissions; Statistics Canada figures for Canadian greenhouse gas emissions.
12 1990 was a strike year for 3 major GHG emitting producers in the steel industry. Actual emissions in that year were 14.2 Mt. Adjusting the 1990 GHG emissions to 17.4 is more in keeping with the 1985 to 1989 GHG emissions of 18 to 19 Mt/yr.



Foundation Paper and Preliminary Analysis of Actions and Opportunities

The *Iron and Steel Foundation Paper*[13] provides a good first look at the sources of GHG emissions from this industry and in it several "big-hit"[14] actions were identified that were believed to have the potential to further reduce GHG emissions. With 14 actions identified, the industry proceeded to assess the viability of the actions to contribute to Canada's Kyoto emission target. Of the 14 actions identified, only 4 were deemed to be technically feasible within the Kyoto timeframe and were analyzed in more detail. These actions include:

- Basic oxygen furnance (BOF) gas recovery to provide low grade fuel
- Improved efficiency of reheat furnaces to reduce fuel consumption
- Lightweight vehicles with higher strength steel - reduce fuel consumption
- Replace a portion of the clinker in concrete with blast furnace slag

Combined, the two actions applicable to steel production processes would only achieve a reduction of 0.3Mt of CO_2 equivalent in 2010 at a combined net present value of -$40 million. These actions require substantial capital investment ($25-300 million) which is a significant barrier to their implementation.

Analysis of Actions and Measures

The steel industry, the Government of Canada and Beddows-Hatch in a collaborative effort undertook a plant-level analysis to assess greenhouse gas mitigation actions technically feasible in the Kyoto period as well as government measures or policies that could encourage implementation of these actions in the Kyoto period. The analysis focussed specifically on two actions which, after a broad screening, were judged to be the most promising: 1) improvements to reheat furnace efficiency and 2) co-generation using by-product gases. It was based on input from companies representing 75% of the industry's production capacity.

The study concluded that approximately half of reheat furnaces in the industry had already been upgraded. Modification of the remaining furnaces could reduce greenhouse gas emissions by approximately 200 ktonnes in 2010. Investment in the modification of reheat furnaces yields a positive Net Present Value at a discount rate of 15%, but the payback period is longer than typically accepted in the steel industry. Incentive measures such as an Accelerated Capital Cost Allowance or a Tax Credit could reduce the payback period for this and potentially other energy-efficiency improvements, encouraging more rapid investment.

13 This can be found in the Minerals and Metals Foundation Paper.
14 Those actions that would result in the greatest GHG emission reductions.

Co-generation using by-product gases also generates a positive Net Present Value at a 15% discount rate, but the payback period of eight years is prohibitive. (This is a conservative case. A merchant-scale co-generation facility using some natural gas as well would be more economically attractive, but would require commercial sale of electricity.) Co-generation would not reduce on-site greenhouse gas emissions, but would reduce the need for marginal electricity generation capacity elsewhere. Estimated reductions in greenhouse gas emissions range from 465 kilotonnes to 1000 kilotonnes, depending on which electricity generation facilities are displaced.

To achieve the full benefits of co-generation a multi-sectoral initiative would be required, and governments would need to remove regulatory barriers. This option is worthy of further analysis.

A government penalty measure such as a carbon tax would be counter-productive. It would impose a further cost on the industry but would not significantly change the industry's operations because there is no technological alternative to coal for integrated steelmaking, the major source of greenhouse gas emissions in the industry. By imposing additional costs such a measure would increase the capital constraints facing the industry, thus slowing investments in energy efficiency and other capital improvements.

Government measures which increase costs would create serious potential risks to the industry's competitiveness. While 79% of steel imports come from signatory countries and over 90% of exports go to signatory countries, Canada risks undermining the competitiveness of the domestic industry unless all other parties impose similar costs. In addition, non-signatories, although they hold a small portion of the market today, could sharply increase their market share or depress prices. The impact of a carbon tax on the steel industry relative to competitors in non-signatory countries would likely be severe.

Opportunities for the Future

Canadian steel producers believe that, like in the past, future GHG emission reductions from the steel industry are to be found in three opportunity areas. These areas include recycling, process improvements and product applications.

Recycling

Steel made by recycling uses about one sixth of the energy needed to make steel from virgin materials (i.e. there is a 6 to 1 ratio in energy consumption in steel production from virgin and recycled materials). Recycled materials, used in both electric arc furnaces and basic oxygen furnaces, account for about 50% of total iron units consumed in Canada. Around the world, only 35% of iron units come from recycled product. Canada already has high rates of recycling of automotive vehicles, appliances as well as food and other containers. Steel reclaimed from machinery and the built environment is also recycled. Future gains will require enhancing the systems for reclaiming non-automotive scrap.

Process improvements

The industry anticipates continuing improvements in energy efficiency through incremental adjustments to production processes. There is a possibility that significant indirect reductions in greenhouse gas emissions could be achieved in the medium term through new coke-making technologies combined with co-generation. Production technologies with low or even zero CO_2 emissions are on the horizon, but far from technically mature. Their long-term feasibility will depend on the availability of very low cost hydrogen (not yet technically possible) and electricity. If proven technically and economically sound, their rate of implementation will depend on the timing of capital stock turnover.

Product applications

The use of new high strength steels can save emissions by reducing the volume of steel needed for transportation equipment, appliances, pipelines and construction. They can also improve the energy efficiency of steel-bearing products. For example, the UltraLight Steel Autobody project, sponsored by an international consortium of steel companies, has demonstrated that high strength steels combined with manufacturing technologies already in use can reduce the weight of a family sedan enough to improve fuel efficiency by 4%. This could yield important reductions in greenhouse gas emissions. Similar benefits can be gained from high strength steels in rail cars.

3.4.4 Mining, Non-Ferrous Metal Smelting and Refining Industry

The mining industry is one of the largest contributors to Canada's export trade. The sector ranks number one in the global production of potash and uranium, and is amongst the top five leading countries in the production of 17 other major minerals and metals. As was demonstrated in the *Mining, Non-ferrous Smelting and Refining Foundation Paper*, mining, smelting and refining are energy intensive industrial activities, with energy consumption representing roughly 10 to 25 percent of total production costs. Canada's mining (metal and non-metal) and non-ferrous smelting and refining (excluding aluminum and magnesium) industries accounted for about 7.9 percent of total industrial energy consumption in 1997 and about 8.1 percent of direct industrial carbon dioxide (CO_2) emissions.

The industry is currently preparing both an *Options Paper* and a *Plant Level Analysis of the Implications of Reducing GHG Emissions for the Mining Industry*. The *Options Paper* will provide an indication of the cost and the ability of the mining industry to further reduce GHGs when faced with various policy measures. *The Plant Level Analysis of the Implications of Reducing GHG Emissions for the Mining Industry* will demonstrate the impacts that various policies will have on three firms (i.e. it will provide real life examples to support the *Options Paper).*

The following 7 key messages embody the themes and conclusions that the mining industry has established from their ongoing work.

The Canadian mining industry will be part of the solution towards reducing Greenhouse Gas Emissions (GHG).

The challenges to meet the Kyoto Protocol are complex; the potential social, economic, and environmental cost of meeting the requirements of Kyoto are high. Canada has committed to take a lead role in limiting emissions and the mining industry wants to be part of the solution. The mining industry believes that prudent precautionary measures are necessary to ensure a healthy environment and economy. A credible response requires industry action and leadership.

Metal, non-metal mining and non-ferrous metal smelting and refining (excluding aluminum and magnesium) represent approximately 1.4 percent (1996) of Canada's total GHG emissions. Action by the mining sector alone is not enough, all sectors of Canadian society must become engaged to contribute to reducing Canada's greenhouse gas emissions. Future reductions will require government leadership in a way that achieves an ongoing environmental, social and economic outcome for the benefit of all Canadians and the global community.

Canadian mining technology exports will reduce GHG emissions

Canada's mining and services sector is a global leader. Today, Canadian junior and senior mining companies listed on Canadian stock exchanges hold interests in roughly 3,300 mining projects in over 100 countries around the globe. Our technological expertise and success in energy efficiency improvements will held reduce GHG emissions around the world. Joint implementation (JI) and the Clean Development Mechanism (CDM) are two examples of how

Canadian technology and expertise can be used to gain credit for making emissions reduction investment in other countries.

The mining industry has demonstrated the relationship between trade and investment, with Canadian investments in mining operations leading to the export of Canadian equipment and services from the exploration stage to metal recycling and reuse.

Today, more than 600 domestic consulting services and equipment companies earn in excess of one-third of their revenues by supplying the mining industry. About 50 percent of the value is exported, much of it to Canadian mining companies operating around the world. The strategic direction of many of these Canadian-based businesses is partially determined by the Canadian mining industry, resulting in value-added exports, increased employment, and a higher standard of living for all Canadians.

Climate change is a global issue requiring a global solution.

The Canadian mining industry operates in a very competitive and increasingly global arena. Although we export roughly 80 percent of our production representing 14 percent of total exports -- 1 in every 7 export dollars -- we remain price takers in an international market. Since Canada's mining industry does not compete on price, its competitive future depends on its technological strength to reduce production costs.

Complicating the global picture is the global growth of the mining, smelting and refining industry, particularly in the developing world. As a price taker in a cyclical sector, Canada's mining industry is concerned that domestic measures will be taken which will increase costs, impact our global competitiveness and replace domestic exports with production from less technologically advanced and efficient countries facing fewer or no commitments under the Kyoto Protocol. Canadian production, jobs and economic growth should not be sacrificed to meet global consumption demands with higher emissions per unit of output.

The Canadian mining industry should be recognized for its northern operations

Canada remains a strong resource nation with abundant geological potential. Recent examples such as Voisey's Bay, Ekati, Diavik, Cheviot, and other world class deposits including the McArthur River project in northern Saskatchewan — the world's largest and highest grade uranium deposit — are only a few examples of Canada's mineral potential. The mining industry does not use climate and geography as an excuse, but our cold climate and large size is a competitive reality.

Mining is one of the few industrial sectors operating in every region of the country. We are also one of the few industrial sectors that are creating jobs and economic growth in the northern and frontier regions. The future of Canada's mining industry relies on new mine developments, which will originate in rural, remote and northern locations, often in areas lacking energy infrastructure.

Mining is an energy intensive industry, but our energy demands are very different from that of our major competitors. New mines will invest in the best available technology, and growth in emissions will be curtailed by energy efficiency improvements. However, the physical location of deposits will, by reason of climate and geography, place restrictions on the choice of fuels and the energy required per unit of output.

Canada should be credited for embodied energy in exports.

Canadians enjoy one of the highest living standards in the world, in large part because we are a trading nation. The mining industry remains one of the largest contributors to Canada's export trade, and we lead the world in the production of potash and uranium, and rank amongst the top five leading countries in the production of 17 other major minerals and metals. As a world

leader, we export roughly 80 percent of our production ($45 billion) using highly efficient technology and extensive use of electricity to fuel our operations.

Like oil and gas, the mining, smelting and refining industry produces and exports and energy intensive product. The emissions from these exports must be included both as part of the mining sector's and Canada's emissions inventory. Although further analysis is required to both estimate the embodied energy in mineral exports and define an international domestic system to credit the Canadian mining industry for the emissions associated with the export of intermediate products, Canada and the mining industry should be credited for the embodied energy in exports.

Cost-effective actions will reduce GHG emissions

Increased competition and rapid technological change have put pressure on our industry to adapt, but they have also created opportunities for efficiency gains and economic growth. We are investing in the right areas. The Canadian mining industry is an industrial and global leader, we have billions invested in capital projects, rank number one in productivity growth amongst Canadian industrial sectors, and invest roughly $350 million annually in research and development, with mining companies representing four of the top 50 Canadian research and development companies in the country.

The Canadian mining industry supports the development and adaptation of best practice technology as a key strategy to reducing GHG emissions. This is possible through cost effective actions, improving productivity, and contributing to a clean environment.

Energy, which represents from 10-25 percent of production costs, is an important and competitive input cost to the mining industry. There are many technical options available to achieve both incremental energy efficiency improvements and low cost capital investments to achieve low levels of GHG emission reductions. There are also several technological research opportunities that offer potential for further reductions in GHG emissions. Although the ability to reduce emissions by changing major production technology (e.g., smelting process) is limited pending cost reducing technological improvements, nations around the world look to Canada's mining sector for the next breakthrough.

Recycling extends the efficient use of metals and results in major energy savings

With a growing global population and rising standards of living, global demand for minerals and metals will continue to increase. While growth will continue to demand the need for primary sources of minerals and metals, recycled materials as a secondary feed source can be used and re-used almost without limit, contributing to a life-cycle reduction in energy inputs required to produce metals from primary sources.

Currently, the use of recycled copper, lead, and zinc represents 45, 60 and 35 percent respectively, of western world metal production. Recycled metals contribute to material conservation, reduction of emissions and reduction of effluents. Furthermore, nickel recycling requires 90 percent, copper 85 percent, and lead 65 percent less energy than primary production.

New business opportunities and GHG emissions reductions opportunities are available through eco-efficiency measures such as enhanced community/commercial/institutional collection and recycling. Following a risk-based approach to metal recycling, Canada can extend the efficient use of metals, eliminate the impediments to domestic and international trade in recyclable metals and metal-bearing material (e.g., computer chips), and benefit from the life-cycle reduction of GHG emissions through expanded metal recycling opportunities.

The federal government should follow-up on its 1996 Minerals and Metals Policy which states, "Recycling extends the efficient use of metals, reduces pressures on landfills and incinerators, and results in major energy savings relative to the levels of energy inputs required to produce metals from primary sources."

3.5 Transportation Equipment Manufacturing Sub-Table

The Transportation Equipment Manufacturing Sector (TEMS) includes the manufacturing of Aircraft and Aircraft Parts, Motor Vehicles, Truck and Bus Body, Motor Vehicle Parts, Railroad Rolling Stock, Shipbuilding and Repair, Boatbuilding and Repair, and Other Transportation Equipment (e.g., motorcycles, snowmobiles, trailers, etc.)

BACKGROUND & OPPORTUNITIES

(1) TEMS Produces Very High Levels of Value Added per Unit of Energy Used.

TEMS is a major part of the Canadian economy, accounting for nearly 3% of Canadian GDP and over 15% of the total manufacturing GDP in 1997. 1997 shipments were approximately $90B, and exports were in excess of $76B. Economic output per unit of energy used (GDP/ton) is 5 times higher than the industry average.

(2) Significant BAU Output Growth Between 1990 and 2010 Will Lead to Increases in Emissions That Will Greatly Exceed the Implicit Kyoto Target of a 6% Reduction from 1990 Levels.

The sector's output is extremely volatile across the business cycle, and 1990 was a low-production year. By 1997, output in the sector had grown 35% and associated GHG emissions levels had grown by 39%.

The long term outlook is for overall sector growth averaging 2% per year. While motor vehicle manufacturing will grow at a relatively modest pace reflecting the mature state of the North American automotive market, Canadian production of automotive parts should grow at a considerably faster pace reflecting labor cost and other trends that increasingly favor Canadian sourcing of auto parts.

Business-as-usual improvements in energy efficiency arising from improved technology are likely to be offset by countervailing trends driving higher energy use, such as increased use of cooling to improve worker comfort, increased energy demand for better pollution control, and shifts to more energy-intensive products and processes. Improvements in emissions per unit of output are expected to be modest. Overall, the sectors emissions are projected to increase by 66.2% between 1990 and 2010, from 2,544 kilotonnes to 4,229 kilotonnes.

(3) Energy Use and GHG Emissions in the Sector Are Relatively Small, Both in Absolute and Relative Terms. TEMS Is Not a Major Source of Greenhouse Gas Emissions and There Are No Obvious Targets of Energy Use Within the Industry That Offer Large Potential for Greenhouse Gas Reductions.

Overall, the industry is not a major source of greenhouse gas emissions in either absolute or relative terms. In 1997, emissions from the sector represented approximately 2.4% of total industry-related emissions. The CO_2 intensity of the sector (expressed in terms of Mt CO_2/GDP output) is estimated to be less than 1/5 of the average CO_2 intensity of the industrial sector in Canada as a whole.

(4) Relatively Few Big Opportunities Exist for Major Emissions Reductions Through the Use of Existing Technology.

Unless there are major breakthroughs in technology for such relatively mundane uses of energy, energy efficiency improvements in the sector are likely to come in small increments. Moreover, the sector as a whole already uses energy fairly efficiently and there are relatively few opportunities available to the sector as a whole that could result in dramatic improvements in efficiency at relatively low cost.

Co-Generation represents the single biggest opportunity for energy efficiency improvement. However, not all industry sub-sectors or even individual facilities are well suited for Co-Generation. Opportunities are also limited by existing policy and individual facility energy profile.

(5) While There May Be Technological Opportunities to Decrease Emissions in Many of the Sector's Uses of Energy, the Gains Are Likely to Be Modest and May Well Be Offset by Countervailing Trends in Output Growth Leading to Higher Energy Use.

Like all other sectors of the Canadian economy, the sector must participate in a meaningful way in reducing its greenhouse gas emissions levels from business-as-usual levels. However, it will be extraordinarily difficult for the sector to meet a sector-specific target paralleling Canada's overall Kyoto commitment to reduce emissions to 6% below 1990 levels.

Large enterprises in the sector, like the "Big 3" automakers and major aerospace firms have very active energy programs and have already adopted virtually all of the most promising energy efficiency technologies.

Small and medium enterprises, like those that characterize the auto parts subsector have not always adopted energy saving technologies to quite the same extent. While further improvements in energy efficiency are possible in the subsector, they may be impeded by barriers that are not easily addressed by public policy. Perhaps the most important barrier is the relatively low level of energy use. With an energy cost averaging less than 0.5% of total cost, there is little incentive to reduce energy in small and medium size companies and facilities where energy costs are low in both relative and absolute terms.

(6) Even If the TEMS Were to Make Full Use of the Technological Opportunities Identified as Being Available to it to Reduce Energy Use, the Sector Could Only Reduce GHG Emissions Output by 15%.

Meeting the implicit Kyoto target of cutting emissions 6% below 1990 levels through enhanced use of technology appears to be a highly unlikely prospect for the TEMS. In fact, it is apparent that the sector will be unable to meet its implicit Kyoto target of reducing emissions below 1990 levels without sacrificing output by approximately 30%. In terms of the overall economy, reducing output from the sector is a very high-cost way to reduce greenhouse gas emissions, given that the industry produces more than five times the value of output per unit of energy input than does the average Canadian manufacturing industry.

POLICY RECOMMENDATIONS

(1) Sector-Specific Policies Are Ill-advised.

Sector-specific policies appear ill-advised because the transportation equipment manufacturing sector is not a major source of greenhouse gas emissions and because major technological opportunities are not uniquely available to it to reduce its emissions. Rather, greenhouse gas emissions from the sector arise from activities common to many industrial (and other) sectors of the Canadian economy such as heating, lighting, electric motors, and industrial process energy. Appropriate crosscutting policies can induce the firms in the sector and other sectors of the economy to make use of cost-effective measures to reduce emissions.

(2) Well-crafted Crosscutting Policies Are Appropriate.

No single industrial process or set of processes dominates energy use in the sector. For the most part, greenhouse gas emissions in the sector arise from sources and activities such as heating, cooling, and lighting that are common to other sectors of the Canadian economy and process energy requirements that are common to manufacturing in general, such as energy to run electric motors and to run chilled water, steam, and compressed air systems.

Certain crosscutting policies are likelier to prove cost-effective in reducing emissions and better at accommodating uncertain outcomes than are others. In particular, policies that are narrowly targeted and relatively inflexible, like energy efficiency standards or technology mandates, are unlikely to be able to target the lowest cost sources of emissions reductions, and are unable to accommodate variability and uncertainties in the cost and performance of energy efficiency technologies. Similarly, targeted tax subsidies for the adoption of particular energy-efficient technologies may well fail to target the most promising of these. Broader tax subsidy schemes applicable to a wide variety of energy efficiency investments run the risk of subsidizing many investments that would have taken place in any event and could entail large government revenue losses.

Crosscutting policies that target well-identified market failures, by contrast, should strongly be considered. If market failures can be addressed at reasonable cost, then market mechanisms are better equipped to find cost-effective means to reduce energy use. Such policies may include public support for greater provision of information about energy efficiency technologies and reform of electric utility pricing so that firms considering establishing Co-Generation plants are faced with economically appropriate energy price signals.

(3) Carbon Fees/Tradable Permits Will Not Dramatically Reduce the Economic Output of the Transportation Equipment Manufacturing Sector.

A cost curve that provides estimates of the likely response of the sector to the energy price increases that would follow adoption of carbon taxes or a system of tradable permits has been developed for the sector. Because technical opportunities within the sector are limited, it is unlikely that any feasible level of tax or permit price can induce the sector to reduce its emissions to 6% below 1990 levels in 2010 by spurring the adoption of energy efficient technologies. Furthermore, even with the much higher energy prices that might result from such policies, energy costs would still remain a relatively small fraction of total operating costs, and it is unlikely that such policies would result in many changes in the sector's output growth as assumed in the BAU forecast. Accordingly, while such policies will reduce greenhouse gas emissions from the sector, these reductions will be comparatively modest when placed against the ambitious Kyoto target of reducing emissions to 6% below 1990 levels.

In particular, even if faced with a carbon tax/permit price of $600 per tonne, the sector could only reduce its greenhouse gas emissions by roughly 12% below its 2010 business-as-usual levels through the use of technological measures. This decrease falls well short of the nearly 44% reduction that would be required to reduce emissions to the implicit Kyoto target of 6% below 1990 levels. While such a large carbon tax implies large increases in delivered energy prices (roughly doubling electricity prices and not quite tripling natural gas prices), even at these levels energy prices would represent only a small part of the cost structure for most firms and operations within the sector. Therefore it is unlikely that energy cost increases of this magnitude will produce large output reductions from the BAU scenario.

(4) Effective Policy Must Be Flexible, Fair, Cost-effective, and Robust in the Face of Both Economic and Technological Uncertainty.

If Canada is to meet its commitments under the Kyoto Protocol at minimum costs to its economy, it should strongly consider employing flexible instruments that use decentralized decisions to find the lowest cost sources of emissions reductions. By providing all emitters with equivalent incentives to reduce emissions on the margin, such policies are guaranteed to be cost-effective. They are also flexible in the face of technological uncertainty: should certain technologies prove to be less promising than initially hoped, offsetting emissions reductions can be generated elsewhere in the economy.

Properly designed crosscutting policy initiatives should permit the sector to reduce its energy use and greenhouse gas emissions from business-as-usual levels. Measures that address well-defined market imperfections at a cost less than their likely benefits should be pursued. In addition, careful consideration should be given to carbon taxes or tradable emissions permits as a primary

instrument to reduce emissions economy-wide. Such instruments would provide the transportation equipment manufacturing sector, and all other sectors of the economy with equal and powerful incentives to reduce emissions in the most cost-effective manner.

Uncertainty is a major factor in policy making. Growth forecasts of the economy are unreliable. Specific sectoral impacts of such things as energy prices are equally difficult to forecast. Effective policy must not depend on being right. Failure to adopt flexible instruments that allow for forecast variations could produce serious negative consequences for the sector and the Canadian economy as a whole. Sector-specific limits or emissions regulations that effectively drive the sector from certain activities threaten to produce large output losses with correspondingly little improvement in GHG emissions. The transportation equipment manufacturing sector adds nearly six times the value added per unit of energy that is typical for Canadian industry. Forcing the sector to reduce output is thus likely to be an extraordinarily costly means of reducing emissions if lower cost opportunities are ignored elsewhere.

3.6 Other Manufacturing Sub-Table

The Other Manufacturing Sector (OMA) comprises: Beverage Industries; Rubber Products Industries; Plastics Products Industries; Primary Textile Industries; Textiles Products Industries; Machinery Industries; and, Electrical and Electronic Industries. In addition, the following sectors of the Chemical and Chemical Products Industries are also included: Agriculture Chemical Industries; Pharmaceutical and Medicine Industry; Paint and Varnish Industry; Soap and Cleaning Compounds; Toilet Preparations Industry; Printing Ink Industry; Adhesives Industry; and, Other Chemical Products.

Key economic, energy and Green House Gas (GHG) emission indicators include:

- In 1995, OMA consisted of some 6,867 establishments and provided employment for some 417,000 persons;
- Between 1990 and 1997, GDP for the OMA grew by approximately 36 percent;
- In 1997, the energy intensity (measured as energy consumption per unit of GDP) for the OMA was 5.67, and this energy intensity decreased between 1990 and 1997 by 9 percent; and,
- Estimated energy related CO_2 emissions for the OMA as a whole for 1995 was 4.7 million tonnes, 0.8 percent of total GHG emissions for Canada.

Most of the establishments in sub-sectors comprising the "Other Manufacturing Activities" face similar circumstances which influence their perspectives related to the amelioration of GHG emissions. For all sub-sectors, energy costs represent but a small portion of their total cost structure which is dominated by labour and material costs. Proposals for capital spending to increase energy efficiency must compete with other internal opportunities for cost reduction and these investment decisions are highly influenced by the expected return on investment. In many instances, the perceived rates of return are higher for investments not related to energy efficiency. In this environment, the challenge is to find solutions which reduce GHG emissions, have no adverse effect on production, are cost effective and/or use off-balance sheet financing which does not impact the firm's internal capital structure.

Related to the above concern, is the fact that most establishments in sub-sectors comprising the OMA derive a significant portion of their revenues from exports and in particular exports to the United States. In the post-Kyoto environment, there is a major concern that policy initiatives may negatively affect the Sector's cost structure and competitiveness in areas where industry competes against countries with fewer (or no) commitments under the Kyoto Protocol.

For some sub-sectors within the OMA, health related concerns are paramount and firms in these sub-sectors must make trade-offs amongst environmental concerns which can negatively impact on the availability of internal capital to address GHG emissions.

The OMA Group has suggested that opportunities for reducing emissions are possible through enhancing primary manufacturing operations; auxiliary (support) operations; and general facility or building-related operations. There is little detail on the overall potential in these areas and it is felt that work to improve baseline knowledge is essential. Equally, there is a feeling that voluntary approaches should be emphasized.

3.7 Small and Medium-Sized Enterprises Sub-Table

3.7.1 Energy Savings & Capital Investment in Canadian Industry

A reduction of greenhouse gas emissions on a scale that would meet Canada's Kyoto commitments would require Canadian industry to upgrade or replace existing production systems with new more energy-efficient structures and production technologies.

For industry, investments in new energy-efficient technologies and capital upgrades have to make financial sense. They must be affordable and they must deliver returns that are at least comparable to those that can be made by alternative investments in productive assets.

Those sectors with the greatest concentration of capital are also some of the most highly energy intensive sectors of Canadian industry. The average service life of machinery and equipment in those sectors is higher than the industrial average. Even with further reductions in the average service life of machinery and equipment as a result of the development of new technologies, the most capital- and energy-intensive sectors of Canadian industry will not go through a complete capital replacement cycle before the year 2010.

Capital investment activity on the part of Canadian manufacturers is closely related to their cash flow (gross profit) performance. Gross profits determine the financial resources that companies have to invest in new technologies, plant, and equipment. They are a source of cash for internally financed investments. And, they provide the earnings in the form of interest and dividends paid to external investors who provide funds raised in capital markets.

The rate of return that companies expect on their capital investments will determine whether or not decisions will be taken to proceed with those investments in the first place. Actual returns on invested capital can be regarded as minimum hurdle rates for investments in new technology.

The rate at which industry is capable of renewing its capital stock is determined not only by the life expectancy or the rate of obsolescence of existing machinery and equipment but also by the rate at which companies are actually replenishing their capital assets in terms of new capital acquisitions intended to replace or augment existing plant and equipment. The rate of capital turnover is determined on one hand by the age, capability, and depreciated value of the existing capital stock, and on the other by the rates of return that are expected on investments in new technologies, plant, and equipment.

Energy costs are an important component of the cost structure of Canadian industry, especially for more capital- and energy-intensive manufacturing sectors. Cost savings achieved as a result of improvements in the energy efficiency of existing production systems or by investments in new, more energy-efficient technologies lead to improved profit performance and higher rates of return on invested capital.

Manufacturing companies will invest in new energy-efficient technologies and capital improvements as long as the returns on those investments are equal to or higher than returns that they could earn on capital investments in other productive assets.

The energy cost savings that can be expected as a result of the energy efficiency improvements required by Canadian manufacturers to meet the Kyoto target will generate capital investments in new technologies as well as in plant and equipment upgrades.

In every sector of industry, the amount of investment generated from energy savings alone falls far short of covering the capital costs that would be required to completely replace existing production systems by more energy-efficient technologies.

If a higher rate of capital turnover is required to meet the Kyoto target, then adequate and competitive returns on that capital investment are required, but they will not be realized as a result of energy cost savings alone.

Adequate returns on investment in more energy-efficient technologies will only be obtained if there are other cost savings or value adding capabilities in new product and service development that can be achieved as a result of investments in new productivity enhancing technologies and production systems that also maximize energy efficiency.

In comparison with larger manufacturing establishments, smaller enterprises generally:

- Realize higher gross profit margins;
- Experience more volatile profit performance;
- Invest a smaller percentage of their annual gross profits in new capital;
- Realize lower rates of return on their capital investments;
- Invest more in relation to the earnings they expect from their capital investments;
- Have a higher rate of capital turnover;
- Spend less on energy in relation to total operating costs and gross profits;
- Save less as a result of reductions in energy intensity;
- Are prepared to invest less in new technology and capital improvements in order to realize the energy cost savings that would be required in order to meet the Kyoto target.

In relation to the industry average, the more capital- and energy-intensive sectors of Canadian manufacturing tend to:

- Invest a higher proportion of their gross profits in new capital;
- Realize lower rates of return on their capital investments;
- Invest more in relation to earnings expected from their capital investments;
- Have a lower rate of capital turnover;
- Spend more on energy in relation to total operating costs and gross profits;
- Save more as a result of reductions in energy intensity;
- Be prepared to invest more in new technology and capital improvements in order to realize the energy cost savings that would be required in order to meet the Kyoto target.

Policy options aiming to encourage the adoption of new energy-efficient or emissions-reducing technologies should thus:

- Encourage companies to increase their rate of capital investment and capital replacement;
- Encourage companies to invest in the most energy-efficient or effective emissions-reducing technologies currently available in their ongoing capital replacement processes;
- Help companies achieve optimal efficiencies with respect to existing production systems;
- Encourage the development and adoption of new, low cost energy-saving and productivity enhancing technologies;
- Increase (or at least not reduce) the returns that companies can expect from their capital stock;
- Help to offset the volatility with respect to profit performance on the part of smaller establishments;

- Provide more favourable tax treatment for capital depreciation through accelerated capital cost allowances;
- Encourage overall improvements in operating efficiencies and the adoption by industry of new more highly productive technologies, while recognizing that energy cost savings are only one of the advantages that can be gained by such innovations;
- Focus their emphasis with regard to the cost savings that can be expected as a result of enhanced energy efficiency to mid-size and large companies (with more than 100 employees) and to the more energy-intensive sectors of manufacturing;
- Emphasize, particularly for smaller companies, that the adoption of more efficient operating processes and technologies go hand in hand with other productivity improvements either in the form of overall unit cost reductions or in the development of new product and service capabilities;

Possible public policy options include measures that would enhance rates of return on investments in productive and energy efficient technologies, and increase rates of capital investment and capital turnover, such as:

- Reductions in capital taxes;
- Reductions in corporate income taxes;
- Accelerated capital cost allowances on more energy efficient technologies; and,
- More efficient regulatory procedures that would reduce business compliance costs.

3.7.2 Customer/Supplier Environmental Initiatives

Introduction

The Small and Medium-sized Enterprises (SME) Working Group of the Industry Issue Table has chosen to study three options for achieving greenhouse gas reductions in the SME sector. One of these options is the use of supply chain management, whereby large companies introduce environmental criteria into their purchasing specifications. These criteria are intended to encourage improvement in the environmental performance of their suppliers.

The purpose of this report is to examine different environmentally-oriented supply chain initiatives which have been implemented by large companies, and to consider whether voluntary supply chain initiatives are likely to be effective in encouraging greenhouse gas reductions by SME's in Canada. The primary focus of this study has been the development of five case studies, supplemented by a review of literature concerning voluntary environmental initiatives and supply chain management.

Supply Chain Environmental Management

Early environmental supply chain actions were motivated by concerns about product liability associated with hazardous materials, and consumer activism about solid waste. Subsequently, development of concepts such as product life cycle analysis, extended producer responsibility, and shared product responsibility, prompted some companies to consider more comprehensive environmental supply chain initiatives. Other drivers include protecting corporate image; responding to customer concerns about the environment; ensuring a secure source of supply; enhanced competitiveness through clean technologies and processes; and improved product quality resulting from closer supplier relationships.

Various tools and strategies are used by companies trying to influence their suppliers' environmental performance. These include:

- Clear communication of environmental values, policies and practices to suppliers
- Questionnaires, self-assessments and audits of suppliers
- Technical assistance and training

- Engaging suppliers in design for the environment and reverse logistics
- Working with industry peers to standardize environmental requirements
- Developing lists of approved products (and lists of chemicals to be avoided)
- Purchasing policies that require certain product attributes (e.g. recycled content)
- In general, promoting more collaborative relationships with suppliers and customers.

Overall, supply chain environmental management is in its development phase in North America, embraced most by environmental leaders, large transnationals, and some public sector agencies.

Case Studies

This report includes five case studies of supply chain environmental management:

Ford Motor Company of Canada	Ford has a comprehensive set of environmental strategies that affect most of their vendors. Ford selects Tier 1 suppliers through a screening process including a written commitment by the supplier to meet certain environmental requirements. Ford also recommends ISO 14000 as a strategy for their Tier 1 suppliers. Products supplied to Ford must be packaged and delivered in specific ways that are returnable or recyclable. Instead of wooden pallets, suppliers use reinforced plastic dunnage that the supplier must take back. Ford has also developed a novel approach to supply contracts, in which some suppliers are paid based not on the amount of product they supply, but on a per unit of production basis. This encourages minimization of material use. Ford also has a material restriction policy where certain toxic materials cannot be present in the products supplied to them. This concept then tumbles to the Tier 2, 3 and 4 suppliers, as each level must ensure that these toxics are not present in the sub-parts supplied.
Government of Nova Scotia	In 1996, the Government of Nova Scotia adopted an Environmentally Responsible Procurement Policy. The government made a commitment to use guidelines developed by existing programs/agencies such as Environmental Choice, CSA, Energuide, and PowerSmart. The policy supports procurement of goods and services from manufacturers and suppliers who are either certified by these programs, or can demonstrate to the purchaser's satisfaction that they meet the criteria set out by the programs. A related initiative is the Nova Scotia “Greening of Government Tiger Team”, an initiative of the Nova Scotia Federal Council. Although a federal initiative, the team is open to participation by other agencies. The Greening of Government Tiger Team has representatives from 10 Federal Departments/Agencies, and two provincial agencies. This group is focussing on green procurement, through such initiatives as development of a resource guide with information on environmentally responsible products.
Bell Canada	In 1995, Bell Canada introduced a two part questionnaire for suppliers, which asks questions on environmental programs and product stewardship. Suppliers are asked to provide information on their environmental management system, and on such topics as life cycle analysis, packaging minimization, design for disassembly, use of hazardous materials, and disposal or recycling at the end of product life. The questionnaire includes a scoring system and highlights potentially serious issues for further review with Bell staff. The approach chosen for implementation was to begin with Bell Canada’s largest suppliers, on the assumption that the greatest influence and environmental impact could be obtained among these firms. Starting in 1999, Bell will begin to audit suppliers, to add their evaluation to the supplier’s self assessment. Bell intends to audit 10% of respondents annually.
Nestlé Canada	Nestlé Canada has taken a risk management approach to supply chain management, targeting selected suppliers for a thorough environmental audit of their operations. The physical plant, production, maintenance, logistics and overall management are assessed for environmental risk and control. A written report is presented to senior managers at the end of the audit. Suppliers are expected to establish objectives and targets for reducing environmental impacts. The supplier’s progress toward improvement is supported and monitored by Nestlé Canada. Nestlé Canada began auditing the environmental management of its suppliers in 1998. The audits are comparable in scope to those required for ISO 14001 certification, but are tailored to the particular circumstances of each supplier. The three environmental priorities in these audits

	are energy, water-borne effluent, and solid waste.
International Case Studies	***Volvo*** uses its Environmental Priority Strategies (EPS) tool to compare environmental life cycle impacts of different materials for use in its automobiles. This information can be used to guide product design and influence the company's purchasing requirements. Another important Volvo initiative is a requirement that the company's suppliers meet a set of environmental conditions. These requirements address such areas as environmental management systems, and prohibitions/restrictions on listed chemicals. Suppliers are also required to complete a detailed environmental self-assessment. To assist suppliers in improving environmental performance, Volvo organizes environmental training courses for its suppliers. ***Canon*** formally announced its green purchasing program in 1997. The company evaluates purchases based on both the potential environmental impacts of the product, and on the environmental practices of product's manufacturer. For the products, 28 parameters are considered. For the manufacturer, 35 parameters are considered. A product's overall environmental score is calculated by combining weighted product and manufacturer scores. Canon has established a preference for products with scores above a predetermined threshold. ***Nike's*** corporate environmental policy states that the company will "promote our practices throughout the supply chain and seek business partnerships with suppliers who operate in a manner consistent with our values." The company supports suppliers by giving them the tools to implement sound environmental management, including a program known as Management of Environment, Safety, and Health (MESH), which provides a framework for environmental improvements. To help suppliers implement this management system, Nike has organized a series of workshops in four Asian countries. Nike is also working with suppliers in other areas, to reduce pollution and waste in manufacturing.

General Lessons from the Cases

Environmental supply chain management is not yet widespread in Canada. However, the practice is well established in some companies and organizations, and can be expected to become more established over time. The reasons for company involvement in environmental supply chain management are diverse. An overarching influence appears to be corporate environmental goals and policies, which can serve as important drivers.

Large companies **can** influence suppliers through environmental supply chain initiatives. Key characteristics of effective supply chain management include: top level leadership; cross-functional integration within the company; effective communication within companies and with suppliers; and effective processes for targeting, evaluating, selecting, and working with suppliers.

Although environmental supply chain initiatives can be effective, the impact to date has been limited in Canada due to the early stage of development. Moreover, other factors are generally assigned greater importance in the purchase decision. Environmental issues are considered, but price, delivery, customer preferences, and other product attributes are generally dominant.

GHG Reductions and Voluntary Initiatives

The supply chain does provide opportunities for customers to influence the activities of their SME suppliers with respect to greenhouse gas emissions. There are, however, challenges and constraints associated with this option. There is little evidence that supply chain initiatives have to date been used to achieve significant GHG reductions.

A GHG supply chain initiative will require the voluntary involvement of a broad range of major companies and organizations (customers), if the initiative is to have significant impact. While individual companies may have a corporate interest, without broad involvement the greenhouse gas impact is likely to be small. There is no reason to believe that this broad involvement will occur spontaneously (i.e. in the absence of a specific catalyst or "driver").

Numerous options are available to companies interested in encouraging reduced GHG emissions via the supply chain. Most obviously, reductions can be achieved through the purchase of products that are, themselves, associated with reduced GHG emissions (e.g. energy efficient products). Opportunities to influence the emissions of suppliers in their own operations include specification of products produced with minimum GHG emissions; direct requests to suppliers to meet energy or emission goals; and implementation of more general requirements, such as ISO 14000 certification.

Successful application of supply chain approaches will also require efforts to facilitate and support compliance by suppliers. The limited resources of SME's constrain their ability to respond to new initiatives arising from their customers. This suggests that any new climate change initiative should not place new demands on SME's without providing technical expertise, and perhaps financial resources, to assist in implementation.

Policy Options

To address the opportunities and constraints noted above, the SME Working Group of the Industry Issue Table has identified four policy options for discussion purposes.

Policy Option A: Government Programme to Encourage GHG Supply Chain Initiatives
Environmental supply chain initiatives are at an early stage of development in Canada, and application to greenhouse gas reduction has been very limited. This policy option involves a government support programme to encourage GHG supply chain initiatives. This programme could include elements such as promotional activities, publication of a manual or guidebook, and third party verification.

Policy Option B: Leadership/Recognition Programme for Supply Chain GHG Reductions

A voluntary leadership/recognition programme for supply chain GHG initiatives may encourage some companies and organizations to become involved in supply chain initiatives. Such a programme could be implemented via the existing CIPEC or VCR programmes, or via industry associations.

Policy Option C: Credit for Supply Chain GHG Reductions

Large companies and organizations will be most interested in GHG supply chain initiatives if they receive credit for the resulting GHG reductions. As such, the Credit for Early Action mechanisms (now under development) could provide an important stimulus to supply chain initiatives, by allowing customers to receive full or partial credit for savings by suppliers (where these savings arise from the supply chain initiative).

Policy Option D: Government Programme to Support SME Participation

While widespread involvement of major customers is the key initial requirement for a GHG supply chain initiative, a successful program must also ensure that the SME suppliers are able to respond to the initiative. This requires support in several areas, including: access to financing, provision of technical expertise, and recognition for participating SME suppliers.

3.7.3 SMEs and Climate Change Synergies Project

This report was prepared by ICF Consulting, Peck & Associates and the members of the SME Working Group of the National Climate Change Secretariat's Industry Table. It focuses on ways to enhance the engagement of manufacturing SMEs and proposes measures to improve the efficiency of existing programs through improved synergy and partnering between organizations that work with SMEs.

The research methodology involved a combination of interviews with a variety of program managers from the federal and provincial governments and non-governmental organizations, a

literature review and a workshop. The following is a summary of the major conclusions and recommendations.

There are a number of challenges associated with improving the engagement of SMEs in activities that make business sense and reduce GHG emissions. These challenges include: lack of interest, lack of knowledge, competing priorities, lack of human, technical and financial resources, and high transaction costs.

SMEs may consider climate change to be a 'big government and big industry' issue and for most, climate change is not 'on the radar screen'. They are engines of job creation but face difficult challenges related to their basic survival.

There are opportunities to improve the engagement of manufacturing SMEs through improved partnerships but this requires sufficient human and financial resources to invest in the relationship building and information exchange required. There are also some clear needs that, if met, would help to improve partnering and program delivery. For SMEs these needs include:

- Consistent information on the business opportunities/challenges related to climate change and other incentives to become engaged in behavioural change; business benefits first – climate change benefits as a result.

- Easy access to information on programs that help them:
  - Assess their opportunities;
  - Implement;
  - Monitor progress; and,
  - Continue to improve.

- Programs that do not require a high degree of administrative complexity or transaction costs.

Program deliverers that provide information, products and services to SMEs require:

- Information about climate change and what is happening federally and internationally on climate change implementation for program officers (e.g., what are the possible negative and positive impacts of addressing climate change for SMEs?)
- Dynamic information about SME programs and partnership opportunities. This could include program best management information.
- Information about the strategic issues related to successfully engaging SMEs and issues related to the 'demand' side of the equation
- Some degree of co-ordination of common resources whether it's technical competence or greenhouse gas emission reduction reporting.
- Networking opportunities around climate change that take advantage of regional and local capacities.
- Some form of recognition for investments in successful interdepartmental partnerships.
- Resources to be able to develop effective partnerships.
- Climate change business information that can be used by a variety of existing communication vehicles (e.g., Info Fairs) and agencies that deal with SMEs.

These are the recommended next steps:

- *Standard Information on Business and Climate Change*. Develop a standard information package on climate change and the impact on SMEs which includes information such as:

  - What is climate change, and what is Canada's role internationally.
  - What are the possible negative and positive business impacts of meeting Canada's Kyoto commitments. (i.e. How might SME suppliers be impacted by large customers and

technological changes, what might emission trading credits mean for your business, what new technologies can improve competitiveness and reduce GHGs etc.).
- How other SMEs are improving their business competitiveness and reducing GHG emissions.

- *Baseline Survey on SME Information Needs and Climate Change Awareness*. Conduct a national cross-sectoral SME survey to determine:

  - The level of awareness of climate change as an emerging business issue;
  - The type of information SMEs need to make business decisions that result in GHG emission reductions.
  - The level of awareness about existing program support.

  The survey should build on information provided by other organizations research, such as the Alliance, other industry associations and the Public Education and Outreach Table.

- *SME Web Site on SME Business Opportunities and Climate Change*. This would be established for program managers and SMEs. The establishment of the web site could build on existing web based information and include, for example:

  - Dynamic information about SME programs and opportunities for partnerships (e.g., a clearinghouse function);
  - Standard climate change and business information;
  - Case studies on innovative projects etc.

- *Regional Networking Workshops among Program Deliverers and SMEs*. The workshops would serve three primary functions:

  - Disseminate information about climate change and programs to SMEs on best practices from industry leaders, new business opportunities, relevant climate change policy developments etc.;
  - Facilitate direct networking and partnership development for improved program delivery at the local and regional level among Program Deliverers; disseminate information about demand side SME needs, strategic communications issues and relevant climate change policy developments; and
  - Provide an opportunity to gather information about regional and local programs, partnership needs, best practices etc. for a clearinghouse.

- *Establish a Co-ordinating Mechanism*. There was no support for an SME Secretariat, however it was acknowledged that some mechanism will be required to continue to co-ordinate program partnership development and improved SME engagement after the current climate change process is completed. The Climate Change Secretariat may wish to establish a new 'SME Working Group' and give someone responsibility for ensuring that the needs and opportunities of SMEs are acknowledged and acted upon in the future.

3.8 Forest Industry[15]

The forest industry occupies a strategic position in terms of the realization of Canada's commitments resulting from the Kyoto Protocol. The industry could attain the GHG emissions-reduction goal for the sector established at 4.2 Mt CO_2, .without major financial contribution from government. A strategy for GHG emissions reduction in the forest industry could be developed around three axes: energy efficiency improvement, fossil fuel substitution, and an increase in carbon sequestration.

[15] Although formally part of the Forestry Table, a summary of options for the forest industry prepared by the Canadian Pulp and Paper Association (CCPA) is included here to give a broader overview of industry actions and opportunities.

The first two axes would mean the modernizing of equipment and a re-thinking of maintenance procedures. Implementing a set of measures could enable the forest industry to make a contribution in the order of 9.5 Mt CO_2 by 2010. However, developing some of these measures would be conditional upon government participation, principally through tax incentives to mitigate the impact on investments, support for technology development and innovation in black liquor integrated gasification and combined-cycle cogeneration, and by promoting policies that foster the use and sale of renewable energy. In the latter instance, de-regulation of the electricity market is a pre-requisite for CPPA. Taken together and set against a 20-year time frame, these measures would enable a reduction in the range of 182 Mt CO_2 as shown in Table 1.

The third axis is the development of carbon sinks. This should be a basic element of a national strategy for GHG reduction. In fact, CPPA considers carbon sink expansion to be as vital as CO_2 emissions reduction. Seen in this light, forest management offers a potential for sequestration deserving both national and international recognition. Accordingly, as with its reforestation and afforestation operations, efforts such as improving tree growth, juvenile spacing, commercial thinning, control of pests, disease and forest fire, as well as carbon storage in wood products should also constitute potential credits. These kinds of measures are not without value; they could decrease the GHG reduction effort by about 23 Mt CO_2 over a 10-year period.

Moreover, CPPA supports the development of a national and international emissions-rights exchange mechanism. Regarding this point, CPPA believes an information centre should be set up that would help the industrial sector stay informed on all aspects of a such a mechanism's operations and subsequently identify business opportunities.

Finally, the forest industry underscores the importance of voluntary initiatives, the efficacy of which it has demonstrated in the past. The industry hopes the voluntary approach will be maintained and prioritized. The industry also requires that the government make it clear as soon as possible that the industry's GHG emission reductions stemming from the voluntary approach will be credited to it. Credits would be based on a reference year (starting from 1990), which the industry would be free to designate. Although the industry appears to be well positioned in terms of reaching its reduction goals, this advantage is strongly linked to governmental decisions that will be made concerning recognition of credits for actions, both past and future.

TABLE 1: SUMMARY OF CPPA'S PROPOSED MEASURES TO REDUCE GHG EMISSIONS[1]

Measure	Incremental Cost (1997$) Capital (M$)	O&M (M$/yr)	Fuel (M$/yr)	Electric. Revenue ($M/yr)[3]	Cost Effectiveness 1997$/tCO$_2$ (10% disc.)[4]	GHG Emission Reduction or Offset MtCO$_2$ 2010	GHG Emission Reduction or Offset MtCO$_2$ 2020	Incentive to realize measure[7] (40% disc.)	Other Considerations
Energy Efficiency									
1. High energy-efficiency auxiliary technologies in p&p mills	48.1	-111.5			-90.8	0.65	11.0	0	Appropriate capital cost allowance will accelerate imple-mentation of these four energy efficiency measures.
2. Improved maint. and use of existing p&p mill equipment	0	-32.7			-64.1	0.36	3.6	0	
3. Improved maint. and use of p&p mills steam equipment	0	-73.0 lifetime			-61.3	0.85	8.5	0	
4. Improved process thermal integration	197.5	4.0	-98.8		-31.8	1.25	18.7	0	
Fuel Switching									
5. Adopt black liquor integrated gasification and combined cycle cogeneration (BLIGCC) techn.	-23.6[2]	10.4		56.9	-21.1	1.09	21.8	0	Support in R&D and commercial-ization are needed as well as electric-ity deregulation.
SUB-TOTAL Industry measures to reach Kyoto target					**Net saving**	**4.20**	**63.5**	**0**	
6. Increase wood waste co-generation in p&p industry	662.8	20.6	-31.8	118.0	-11.1	2.46	49.1	247	Electricity dereg-ulation needed
7. Fuel-switching - lumber and panelboard mills	666.5	-88.8			-5.4	1.51	30.2	356	Avail. of wood residue is a key consideration
8. Increase number of hog fuel boilers - 12 mills	234.4	-35.6 lifetime			-3.4	1.33	39.4	111	
SUB-TOTAL Industry measures with incentive					**Net saving**	**5.3**	**118.7**	**714**	
GHG emission reduction potential					**Net saving**	**9.50[5]**	**182.3[6]**	**714**	

[1] All figures in this table are from the Forest Sector option paper. They have not been validated by CPPA and are presented only as an indication of costs.
[2] Capital cost of black liquor recovery powerplant costs less than a conventional powerplant unit. Thus, the negative figure.
[3] Assumes electricity sold at 4 cents per kWh.
[4] Lifetime NPV/lifetime GHG reduction (2020)
[5] More than 2 times higher than reduction target for the forest sector.
[6] Over 20 years, almost reaches total national reduction objectives that can be as high as 185 Mt.CO_2e
[7] Estimated incentive for realization is the value of the incentive that would have to be provided to make an action financially attractive from the perspective of industry.
For energy actions, it is equal to the Net Present Value (NPV) of the action, derived using a 40% discount rate.

CHAPTER 4 – CONCLUSIONS AND RECOMMENDATIONS

As noted in chapter 1, the mandate of the Industry Table was to develop a broader understanding of the challenges and opportunities facing industry in responding to climate change, and to evaluate a range of options for reducing greenhouse gas emissions in the context of the National Implementation Strategy. Further, the Table sought to recommend solutions that will contribute to the competitiveness of Canadian industry and result in no undue burden upon any region or sector.

The Table agreed to evaluate actions by industry and measures by governments that taken together could reduce industry emissions of greenhouse gases to the levels implied by the Kyoto target. But this task must be considered in light of the widely varying circumstances and emissions profiles of the sectors represented at the Industry Table, and the actions that already have been taken since 1990 to address industry emissions.

According to 1997 data from Environment Canada, the sectors that make up the Industry Table represented approximately 33 percent of total Canadian GHG emissions, and aggregate industry emissions had increased by 17 percent from 1990 to 1997. Thus, this defines a significant "gap" (17% + 6%) between 1997 and the Kyoto timeframe (2008 to 2012). Some sectors have shown that they can achieve or exceed the –6% target based on actions already taken, enhancement of voluntary commitments and projected industry growth, with little or no change to existing policies. Other(most) sectors on the other hand, consider that with the economic growth opportunities they forecast they will not be able to close the gap through incremental energy efficiency improvements or more aggressive adoption of new technologies in the relatively short time frame involved.

Overall for the Table, while consolidated data is not yet complete, it is clear based on present assumptions that the voluntary challenge together with enhancements will fall far short of the Kyoto commitment. Put another way, there is no "win-win" agenda for the industry sector overall that would close the gap in short-term. Whatever measures governments might choose to attempt to accelerate reductions in the near term (beyond an aggressive approach to the voluntary challenge extended to all elements of the Canadian economy) will impose economic penalties on industry and on the country.

Through the work of the sub-tables, the Industry Table agreed to consider a number of actions and measures that had potential to close the gap. In addition, the Table agreed to work with the Analysis and Modelling Group to define a number of "cross-cutting" measures that might be applied to industry more generally. These fall into four broad groups: 1) enhanced voluntary action; 2) co-generation; 3) financial incentives; and 4) carbon taxes / emissions trading. The sub-tables are currently working with the AMG to assess the potential of these measures to reduce greenhouse gases as well as to model their economic implications. Eventually the results of these "micro" assessments will have to integrated into a macroeconomic model to ensure the interactive implications among the various sectors and between the other Tables is properly taken into account.

It will take some additional time to complete this work and fully integrate the results. Nonetheless, based on all of the work conducted to date by the Table and sub-tables, some important conclusions need to be stated.

4.1 Key Recommendations

- ***Canada should not consider ratification of the Kyoto Protocol until such time as there is a much better understanding of the full implications for the country, and until the rules of the game internationally are clear, as well as the actions that will be taken by our trading partners and competitors.***

- ***Canadian action on GHG constraints should only be considered as part of a broad international response to the climate change challenge.*** Adoption of measures (such as significant carbon taxes or "cap and trade" emissions trading) to implement the Kyoto Protocol or other similar constraint on a Canada-only basis, ahead of the rest of the world including the US, would involve a major sacrifice by Canadians with no noticeable impact on global emissions. Furthermore, depending upon the policies chosen to constrain emissions, unilateral Canadian action could have devastating implications for the competitiveness of energy intensive industries in Canada. Even in the case of broader international action, careful consideration will have to be given to the design of measures required to address the competitiveness of industry sectors competing with those in developing countries facing no constraint or cost burden.

- ***Given the considerable uncertainty with respect to the evolving regime internationally to support the Kyoto Protocol, the federal government should continue to examine the merits of an international emissions trading scheme as a means to allow Annex B countries to meet their climate change commitments.*** Attention should be paid to ensuring it can be a transparent and efficient means to access least-cost reduction opportunities internationally, and can put Canada and Canadian firms on a level playing field internationally with other countries.

- ***Governments should aggressively support the voluntary challenge and its extension to other sectors of the Canadian economy. Industry can and should do its part to convey this message through a broader championing of the voluntary approach.***

- ***Industry sectors will focus on development of an enhanced Voluntary Challenge and Registry with appropriate goal-setting, mechanisms for accountability and efforts to broaden participation among their customers, suppliers and other significant sources of GHG emissions.***[16]

4.2 Supportive Public Policies

The Industry Table believes that early actions are warranted that can further "bend the line" of Canada's GHG emissions trajectory. As part of this first phase of the national strategy governments should develop supportive public policies in the areas outlined below.

Emissions embodied in Canadian exports

One of the important aspects for Canada in the climate change debate is our standing as a leading producer of energy intensive commodities for world markets. Canadian firms emit significant amounts of GHGs in the production of oil and gas, steel, aluminum and other metals, chemicals, and pulp and paper products which are consumed in those other countries or become the raw material for secondary production. Emissions resulting from the production of these goods for export are added to Canada's GHG inventory while other countries use the products without needing to account for the associated emissions. As an example, close to half of the growth in the "Kyoto gap" in the most recent national emissions forecast is attributed to increased production in upstream oil and gas. Much of this is destined for export to the United States, and in particular a significant portion of the natural gas exported to the U.S. is likely to be used to displace more carbon intensive fuels in electricity generation. In simplest terms, the U.S. gets a GHG bonus while Canada is left with increased emissions. This puts Canada potentially at a disadvantage compared to other countries, although the issue is admittedly complex. In crafting the Kyoto Protocol this subject was not directly addressed, and the Minister of Natural Resources has indicated that it should be. It is worth noting that at least one other country has suggested how it will deal with the issue. Denmark intends to normalize its inventory to account for energy exchanges with its neighbours.

[16] One member believed that enhancement of the VCR should the subject of separate work by VCR stakeholders.

The Industry Table believes that the federal government should continue to examine this question and should continue to explore opportunities to gain greater recognition internationally for embodied emissions in exports. It should engage in an accelerated program of research to determine the significance of emissions embodied in exports of Canadian commodities. As well, the overall Canadian picture should be developed on the basis of exports minus imports to determine how we stand on a net carbon balance sheet basis. As noted above, a particular point of focus should be our exports of natural gas to the United States and discussions should continue on a bilateral basis with the US government.

Co-generation barriers and opportunities

Time did not permit a full assessment of the barriers and opportunities to a fuller utilization of co-generation in Canadian industry. A number of the sector studies identified that there is technical potential for co-generation projects that would allow them to make better use of excess heat and steam in their facilities, and in some cases supply power to the grid (steel, chemicals, forestry, petroleum, automobile manufacturing). However, the actual market potential for some of these projects is uncertain, especially given the evolving state of electricity restructuring and de-regulation in some provinces. Much of this uncertainty may be substantially reduced soon, but it does cloud the current perspective on how significant may be the currently cost-effective opportunities for new co-generation.

Government policy must fully support the considerable potential for co-generation in some industry sectors. It is important that existing regulatory, financial and market barriers be removed as quickly as possible to allow industry to take advantage of these opportunities. At this critical juncture in the development of Canada's national climate change strategy, policy signals from government should be clear with respect to encouragement of co-generation.

Table members identified a number of specific barriers and concerns that currently limit a fuller realization of co-generation opportunities in several industrial sectors. **For a fuller description of the barriers to co-generation and recommended policy options, see Appendix D**.

Financial incentives

The joint analytical work being carried out by the Industry Table and the AMG should provide further insight into the ability of financial incentives to spur investments in GHG reduction actions and technologies. In some cases, changes to capital cost allowance rates or technology commercialization grants may make marginally economic investments more attractive. However, the energy-intensive sectors have focused on improving their use of energy on an ongoing basis for many years, and the analysis done by a number of the sub-tables suggests that this kind of incentive is not likely to be a major determinant in whether industry makes new investments in lower emitting technologies.

While supporting further analysis in this area, the Table is of the view that fiscal prudence is important, and any such incentives will have to demonstrate that they offer considerable advantage in terms of their cost-effectiveness in comparison to alternative policies. As well, it will be critical to avoid measures which could attract countervail actions, particularly in the United States.

After completion of the AMG analysis, the Table will consider further the ability of financial incentives to increase the attractiveness of energy efficiency investments and lower GHG emitting technologies. A particular focus should be on how incentives could be combined with technical information programs for small and medium enterprises to more fully exploit energy efficiency opportunities in this sector.

Domestic emissions trading

The Table notes that the subject of domestic emissions trading is extremely complex and requires much more analysis and discussion. While a great deal of economic literature exists that suggests emissions trading is a relatively cost-effective instrument to meet any given limit on emissions, Canada has very little experience with this type of policy instrument. As well, applying it to a number of greenhouse gases and across a broad range of sources raises additional issues and complexities such that we should be extremely careful before assuming that it is the instrument of choice for Canada.

Mandatory emissions trading would only be needed if Canada chooses to ratify the Kyoto Protocol. That decision is still several years away. In the meantime there is useful work we can do with respect to coverage options, point of impingement, and the implications of different allocation schemes. The allocation issue in particular will be difficult, complex and time-consuming and raises important issues of inter-regional and inter-sectoral equity. As well, because of the level of trade and economic integration with the United States, whether and how the US establishes a system of domestic emissions trading will be a crucial consideration for Canada.

The Table was not able to come to a definitive position on emissions trading. Much of this has to do with concerns with regard to the cap on emissions itself. For reasons more fully explained elsewhere, the Kyoto target represent a serious challenge for Canada and a fixed constraint on the character of our future economic performance.

However, some general recommendations on the subject were developed:

- ***Above all, we should be satisfied that a program of mandatory "cap and trade" offers significant advantages over alternative policy instruments before one is implemented in Canada.***

- ***Emissions trading should not be considered as a "Phase I" measure in the National Implementation Strategy.***

- ***The Table does support a further program of research and analysis with respect to domestic emissions trading. Such analysis should include:***

  - ***Examination of existing trading programs related to other environmental contaminants, both domestically and internationally, to the extent that they are relevant to the design and functioning of a GHG emissions trading program.***

  - ***Consideration of how a Canadian emissions trading scheme can be integrated with the system of international emissions trading which may be established under the Kyoto Protocol, and with any trading program that may be developed by the United States.***

  - ***Gaining a better understanding of the competitiveness implications of different allocation schemes and how best to deal with capital stock turnover and equity issues.***

  - ***Consideration of the use of government revenue that would be generated if allowances are auctioned, including how and to what extent to ease adjustment costs for buyers of permits and for households and downstream users who will be affected by the higher cost of energy and emissions-intensive products and services.***

Monitoring policy developments and business opportunities internationally

For the reasons noted above, the climate change actions which other countries take will be critical to understanding what impact our own domestic policies will have. If we get seriously out of line with our key trading partners and competitors, Canada is likely to suffer economically

without having made a significant contribution to the global problem. At the same time, the Table is mindful of the fact that Canada cannot afford to ignore leading edge developments in our major trading partners, both with respect to government policies and business strategies. Undoubtedly, considerable uncertainty will persist with respect to how significantly the rest of the world will seize the climate change agenda over the next few years. Nonetheless, opportunities for international emissions trading and JI and CDM projects will emerge and we must be careful not to fall behind the private sector in the United States and Europe in terms of seizing opportunities for low cost emission reduction and investment opportunities in other parts of the world. As well, we have some strategic opportunities related to Canadian expertise and technology in the mining, forestry and oil and gas sectors that can be exported to help other countries meet their climate change objectives.

Both government and business should carefully monitor approaches in other OECD countries, especially those related to innovation, technology development and market-based instruments. We will need to pay attention to the pace and design of policies in our trading partners. Canadian firms will need to assess the risks of failing to respond as quickly as major competitors in the global race to supply more energy efficient, climate-friendly products and technologies. The federal government can assist in part by providing enhanced logistical support for companies pursuing foreign offset opportunities.

Canadian research priorities related to climate change

Given the evolving state of the science on climate change and the importance of the issue, governments should be making strategic investments to further our understanding. We should contribute both to the ongoing science effort internationally, enhance our analysis of Canada's particular issues and vulnerabilities, as well as doing further analysis with respect to strategies to adapt to the impact of climate change.

Governments should increase investment in appropriate Canadian research related to the science of climate change and adaptation measures.

Support for research, development and demonstration of climate change technologies

The development and deployment of advanced technologies will key to climate change solutions around the world. Canada and Canadian industry should do more to ensure that it can take advantage of strategic opportunities. Governments and industry can work together to strengthen investments in research, development and demonstration related to low emission technologies and sequestration opportunities (e.g. CO_2 capture and use in enhanced oil recovery).

Governments should increase support for strategic R&D and technology demonstration to enhance the development of low-cost emissions reductions opportunities over the medium to longer term. A consultative process among governments, industry and the research community should be established to develop recommendations on Canadian priorities in this area. Government and industry should also work cooperatively to strengthen climate change technology assessment in Canada through appropriate centres of excellence and international networks.

Strengthen energy efficiency programs

Government programs to enhance understanding of the importance of energy efficiency and to disseminate practical tools and information have proven to be quite effective. Within the industry sector, we are most familiar with the Canadian Industry Program for Energy Conservation and the Energy Innovators Initiative. There is a need to continue to expand the reach of these programs, particularly to small and medium enterprises, but this will require additional resources. A number of other energy efficiency awareness programs directed to residential and commercial buildings, institutions and individual consumers also have potential to help meet Canada's greenhouse gas objectives.

The federal government should consider increasing funding for the Office of Energy Efficiency, Natural Resources Canada.

Baseline Protection and Credit for Early Action[17]

It is critical that immediate and credible signals be sent to Canadian industry about the value of investing today in emissions reduction opportunities. The Table has closely followed the deliberations of the Credit for Early Action Table and at one stage in the debate tabled its own position paper on the subject. The Table also has taken considerable interest in the proposal by federal and provincial governments to develop a scheme of baseline protection.

The Table believes that the federal and provincial governments should move ahead expeditiously to develop a full program of baseline protection. However, baseline protection will only ensure that companies who take early action are not disadvantaged should mandatory limits later be imposed. Governments should continue to explore options for a credit for early action system in full consultation with stakeholders, with a view to determining a simple and equitable design that can stimulate early action to reduce emissions and can do so in a cost-effective manner.

Engagement of Canadians

Climate change is a broad, societal issue and to make progress on our Kyoto target will require actions by all segments of society. Education and engagement of consumers will be critical. The Canadian public must be educated about the science and economics of climate change. Individuals need information about how their own activities contribute to the problem and practical actions that they can take. Programs should focus on consumer awareness and choice, and industry has an important role to play in helping to educate employees, shareholders and consumers.

More detailed recommendations on public education and engagement can be found in the comments on the Public Education and Outreach Table in Appendix B.

[17] The Table received a minority report opposing establishment of a system of early credits on the basis the Kyoto Protocol made no provision for credit for early domestic action in advance of the commitment period. Canada as a whole can get no credit for early action and therefore any "credit" extended domestically by Canada to some firms could only come at the expense of other firms. The likely losers in this "zero sum game" would be small to medium sized enterprises without the resources to participate in what would likely be a bureaucratic exercise of registering and justifying "credits". If the Kyoto Protocol were to be implemented, economic transition to the conditions of the compliance period could be effected more smoothly and efficiently simply by early, clear promulgation of the compliance regime to be imposed than by an early credit system developed in advance of and very possibly inconsistent with any policy eventually implemented. On the other hand, some members argued for development of a CEA system as a priority measure. For example, the aluminum industry advocated development of an early action program with credits for verified reductions and baseline protection to protect the international competitiveness of Canadian industries. The aluminum industry stressed that if our trade partners honour their Kyoto commitments, Canada will be disadvantaged unless it has developed a credit based, early action program with sound emissions monitoring and reporting methodologies, baseline determinations and technology assessments to establish related emissions factors. See also Appendix A.

APPENDIX A – MINORITY OPINIONS

A1. Minority Opinion of Robert Hornung, Pembina Institute, and Friends of the Earth

The Pembina Institute and Friends of the Earth Canada have chosen to submit the following "minority report" to clearly indicate where our views differ from those outlined in the Executive Summary of the final report of the national climate change consultation process' Industry Table.

1. The Industry Table report's Executive Summary asserts that the Kyoto timeframe is too short given that the kinds of technologies that will make a significant and lasting contribution to our climate change efforts will not be commercial for some time yet. We note that the Industry Table made no attempt to examine or assess opportunities and technologies for greenhouse gas emissions reduction outside the industry sector and as a result we believe that the Table is not in a position to justify such a statement.

It is our view, however, that the vast majority of technologies required to meet the Kyoto commitment outside of the industry sector are already demonstrated and proven. This is demonstrated in many of the other reports produced by Issue Tables in the national climate change consultation process. While a number of these technologies do have limited market penetration, we believe government policies (e.g., regulated standards and financial incentives) can accelerate the commercialization of these technologies and their position in the marketplace. In addition, we feel that behavioural change and changes in production processes will also play an important role in greenhouse gas emissions reduction.

Rather than being too short, we believe the targets and timetables elaborated in the Kyoto Protocol represent the minimum first step Canada should take on this issue and that significantly more stringent commitments will be required subsequently.

2. The Industry Table report's Executive Summary asserts that the challenge of meeting Canada's Kyoto target is formidable and not likely achievable without substantial impairment of the Canadian economy. We note that the Industry Table did not examine the potential costs of implementing the Kyoto Protocol for Canada as a whole and as a result we believe that the Table is not in a position to justify such a statement. Nonetheless, the statement has been made and we would like to put on the record our clear opposition to it.

Many economic studies have been undertaken to assess the potential impact of implementing the Kyoto Protocol on Canada's economy. We note that such studies produce a range of results and that while some project a negative impact on Canada's GDP, others project a positive impact. Most importantly, however, the impact in either direction is small, well within the margin of error of the modelling tool. Even the worst case projections envision only a small decline in the projected 35% growth of Canada's GDP over a 10-year period.

We also believe that such models significantly overestimate the costs of implementing the Kyoto Protocol. There are several reasons for this, including:

- a failure to consider the costs associated with doing nothing (e.g., the costs associated with the impacts of climate change and adapting to them),
- a failure to consider the benefits associated with complementary reductions in other pollutants (e.g., improved local air quality and reduced health care costs associated with air pollution), and
- an inability to project future technological change (i.e., there is a long history of such models overestimating the costs of meeting environmental objectives, for example, reducing emissions of sulphur dioxide or emissions of ozone-depleting chemicals).

Moreover, we note that many of the national climate change process issue tables have identified a wide range of cost-effective opportunities to reduce greenhouse gas emissions. In our view, the real costs of implementing the Kyoto Protocol will be heavily influenced by the detailed design of climate change policies – an issue that received limited attention at the Industry Table.

3. The Industry Table report's Executive Summary states that the Kyoto Protocol represents a fixed limit on the use of carbon energy in Canada. We disagree and note that the Kyoto "mechanisms" have been designed specifically to provide some flexibility with respect to the amount of carbon a country like Canada can use. We also wish to stress that the provision of the energy services Canadians depend on is not necessarily tied to specific quantities or types of energy sources.

4. Finally, the Industry Table report's Executive Summary concludes that early actions are warranted that can further "bend the line" of Canada's greenhouse gas emissions trajectory, but we note that the Industry Table has proposed only a limited number of such actions. While the Industry Table should be commended for the work it has done to identify technical opportunities to reduce greenhouse gas emissions in different industry sectors, it has generally proposed few detailed measures governments could implement to facilitate the uptake and implementation of such opportunities by industry.

Unlike other Issue Tables, the Industry Table has failed to identify and define a broad range of measures governments could implement to facilitate actions by industry that would reduce greenhouse gas emission emissions in the sector to 6% below 1990 levels. More importantly, however, it has failed to identify many specific measures governments could take that would allow industry to even capture the technical potential (short of reaching a 6% reduction) for greenhouse gas reductions discussed in the work of the Table.

A2. Minority Opinion of Imperial Oil re Credit for Early Action

Introduction

"Credit for Early Action" (CEA) is a theme with apparent broad appeal that is receiving increasing attention and interest in the development of Canada's national strategy on climate change. It is also attracting considerable attention in the United States, where it has been the subject of a bill introduced in Congress by Senators Chafee, Lieberman and Mack, the "Credit for Voluntary Early Action Act".

Despite the current interest in Canada in advancing this concept, Imperial Oil strongly believes that any CEA system introduced now would potentially create significant problems but provide no overall national benefit. Introducing CEA is not in the national interest; regardless of whatever decision Canada might take later on ratification and implementation of the Kyoto Protocol. Imperial cannot therefore concur with the position of some other Industry Table members in supporting the development of a Canadian CEA system.

Problems with Credit for Early Action

Among the problems with a CEA system are:

Under the Kyoto Protocol, Canada derives no overall national benefit or international credit for early action, and therefore should have no national interest in providing it domestically.

With no national benefit for Canada, CEA therefore creates a "zero sum game" in which credits awarded to one firm for actions taken before the Kyoto compliance period translate into more onerous restrictions on others within the compliance period.

The losers in this game will most likely include small businesses, which do not have the discretionary capital and technical staffs to participate effectively.

If an eventual decision is taken to impose Kyoto, there is a genuine problem of minimizing transition costs and realizing the optimal trajectory of emissions between now and the compliance period. However, a CEA system is not necessary for an efficient transition and would likely encourage inappropriate transition actions if an eventual decision were taken to impose Kyoto.

Introducing CEA amounts to a premature *de facto* implementation of the Kyoto Protocol, in advance of any national decision on ratification and implementation, and in advance of any decision on what an eventual compliance regime might entail. This increases the potential for inappropriate, incorrect, or inefficient business decisions.

In this sense, a CEA system would represent implementation of a policy instrument without an understanding of its economic and fiscal consequences.

CEA systems are biased to "lock in" certain approaches to reducing GHG emissions, limiting Canada's future flexibility to develop policies in the national interest. It creates a group of credit holders with a vested interest in a particular eventual regulatory system.

CEA systems are not needed in order to promote and encourage ongoing investment and actions by Canadian industry to improve their energy efficiency, as there are sufficient market incentives (and verifiable evidence) that this has been occurring and will continue.

CEA systems are subject to additional costs for operation and verification and will require the administrative and enforcement features of any regulatory regime to prevent abuse.

Opposition to CEA covers the spectrum

These problems with potential CEA systems have raised concerns both in industry and within environmental groups. For example, the West Coast Environmental Law association in Canada has written:

Current proposals for credit for early action may prove to be ineffective environmentally, inefficient economically, and inequitable politically. They could potentially shift considerable wealth to some firms while at the same time imposing corresponding costs on the government or economy. (1)

At the same time, the Competitive Enterprise Institute in the United States has written:

Credit for early action may seem at first glance to be a benign, voluntary, market-oriented program. It is actually a political strategy to implement a non-ratified treaty, fuel pro-Kyoto business lobbying, and penalize companies that don't jump on the global warming bandwagon. Far from a "win-win" environmental program, it would produce a zero-sum game in which small business can only lose. (2)

Within Canada, the many issues associated with the design of a CEA system resulted in the absence of any clear consensus in the Credit for Early Action table. In the United States, the Chafee Lieberman bill is widely opposed by both environmental as well as business groups. These all illustrate the wide recognition of the problems with this seemingly attractive, but flawed concept.

Credit for Early Action - the concept

Credit for early action has been the subject of much discussion and technical analysis and many different variants have been proposed at different times. However, the basic concept is straightforward. Firms that take actions, before the start of the first Kyoto compliance period in 2008, to help reduce or moderate the growth of greenhouse gas emissions, and particularly CO2 from fossil energy use, receive credits which they can use later.

Credit can take various forms from recognition to financial grants or release from future regulatory requirements. Imperial has no concern with giving recognition to firms for their achievements in improving energy efficiency and reducing emissions economically - and supports the current VCR program as a means of promoting that.

The concern is with CEA proposals that provide credits in the form of monetary credits or property rights to future emissions. These credits might be applicable in a future emissions trading system or emissions allocations system or applied against future regulatory requirements such as energy or carbon taxes. With Canada's total emissions cap unchanged, the result is a zero sum game in which the losers are likely to be, unfairly, small businesses, businesses of any size which legitimately decline to participate in a putatively "voluntary" program or businesses which simply find their best efficiency investment opportunities falling outside the time window allowed for early action.

The zero sum game problem.

Canada derives no national benefit from taking action in advance of the Kyoto target. The obligations created by Kyoto, if they are to be met (and we assume those targets or similar ones as the context for this discussion, despite our objection to Kyoto) are international obligations. Those obligations apply only to total emissions over the compliance period, while emissions before the start of the compliance period in 2008 are unconstrained. Whether Canada's emissions in 2005 are 400 MT of CO2 equivalents or 800 MT does not change the Kyoto obligation of 563 MT annual average emissions from 2008 through 2012.

In other words, Kyoto provides no internationally recognized credit for early action against a country's target. (There is one exception - CDM projects, but those are not relevant for domestic actions.)

With no international credit available to Canada for "early action," there is little value in Canada providing it domestically. Carbon energy is a vital economic input used to help produce valued goods and services, and there is no value in promoting limits in its use before we have to.

As the international system provides no credit to Canada for early action, attempts by Canada to provide credit, especially in the form of "credits" or "rights" exercisable in the compliance period, creates the prospect of a zero sum game in which credited early reductions by one firm have to be translated later into more onerous restrictions on others.

As an example, suppose the Canadian economy includes only four participants, each emitting 100 megatonnes of CO2 equivalent (MTCO2E) for total emissions of 400 MTCO2E, and suppose Canada's Kyoto target is 300 MTCO2E. With no CEA system, a possible Kyoto implementation regime is to allow each firm 75 MTCO2E. In an emissions trading system, each firm might be allotted 75 MTCO2E worth of permits.

Now suppose that we have a CEA system in place and firms A and B each reduce their emissions before 2008 to 90 MTCO2E each. For this, they each receive "credits" of 10 MTCO2E for use after 2008. However, the target of 300 MTCO2E remains unchanged, leaving an "after-credit" total of only 280 MTCO2E to be distributed, or only 70 MTCO2E each. A and B end up with an allowance of 80 MT each and C and D with only 70 MT each. Whether they face having to reduce their emissions even more down to this level (which could mean some business contraction) or try to buy credits from A and B, C and D are clear losers in this game when all they did was decline to participate early.

Who would be the losers in such a game? Most likely small businesses and consumers who usually have neither the available capital to make additional, perhaps marginal investments in energy efficiency nor the technical and legal staffs to register and substantiate with the CEA bureaucracy even the genuine energy efficiency actions they do take.

As this further illustrates, a CEA system is less a system for crediting participants, but rather one that penalizes non-participants - the antithesis of a "voluntary" system.

The Transition Problem

As explained above, Canada as a whole derives no benefit - and would probably incur uncompensated losses - from encouraging early action in advance of its potential obligations. With no international credit available to Canada for "early action," there seems little value in Canada providing it domestically. Carbon energy is a vital economic input used to help produce valued goods and services, and there is no value - and potentially a net cost - in promoting limits in its use before we have to.

Indeed, a major economic problem we face with Kyoto is determining the optimum trajectory of emissions and energy use between now and 2008. We suggest that if the transition to the compliance regime could be made seamlessly, the optimal strategy for Canada would be no restriction on energy use or early inducement for reductions in advance of the start of the compliance period. The optimal trajectory would be "trends continue" up to December 2007.

Any policy that encourages something different encourages economic activity below our maximum potential before there is any obligation to constrain such activity.

Of course, any transition is not likely to be seamless. However, this establishes that the only real issue with early action is managing the costs of transition from the current economy to the new,

very different, more intrusive, restrictive regime that would be required to meet Kyoto. The optimal emissions trajectory is one that represents a balance between maximizing economic output without any restrictions on energy use until December 2007 and managing transition costs.

However, a CEA system is neither necessary nor helpful in realizing that optimal trajectory. A better approach is to let the market solve that problem by early, clear promulgation of the regulatory regime that would have to be introduced at the start of the compliance period. This allows all market participants, with knowledge of the constraints they are likely to face, to optimally manage their particular transitions.

With such advance information, a CEA system is neither necessary nor desirable. However, a CEA system without such advance information invites all manner of counterproductive, suboptimal activity.

CEA amounts to early, unratified implementation of Kyoto

Canada has made no decision yet whether or not to ratify Kyoto. An important objective of the current national process is to determine just what actions would be required to meet Kyoto, and what their costs would be, allowing an informed decision to be taken. Unless and until that decision is made, CEA has no meaning or relevance. Worse, introducing a CEA program, with its necessary close scrutiny of energy use decisions and of investments to change energy use, amounts to a kind of advance and unpredictable implementation of Kyoto before ratification.

Even without such scrutiny, the "zero-sum" problem means that CEA, rather than rewarding participants, actually penalizes non-participants. This creates an unhealthy race in which firms have to compete with each other in making increasingly marginal investments without national benefit just to avoid being potentially disadvantaged in the future. This becomes a form of *de facto* Kyoto without the democratic scrutiny the current process is intended and designed to provide.

A further problem is that CEA potentially creates a class of vested self-interests in seeing Kyoto implemented, regardless of its merits. Credits earned under a CEA system, while potentially valuable after 2008, are actually worthless unless and until Kyoto is ratified and implemented. Moreover, their value potentially increases with the greater the severity of any national constraint.

Baseline Protection

We are also very uncomfortable with CEA systems that simply aim to provide retrospective or current *Baseline Protection*:

Any system of baseline protection involves trying to measure the difference between what energy use would have been in the absence of certain actions and actual energy use. It is an attempt to measure what the applicant "might have done otherwise" - an inherently unknowable quantity.

The biggest problem is that firms have always taken and will always continue to take actions to improve the efficiency with which they use energy - and the more important energy is as a component of total costs, the more aggressive the actions they will take. The principal motivator for such actions has been and will be the costs savings resulting from such actions - and the presence or absence of any CEA or baseline protection system presumably will not deter them from making such decisions in the future (although uncertainty about future regimes might).

This means that any realistic "baseline" or "trends continue" projection already includes a very substantial set of actions already expected in the future to improve energy efficiency. This makes it very hard to identify true "incremental" actions for recognition in a baseline protection system. Sorting out actions that would have happened anyway and actions that are properly incremental is

virtually impossible. (Question: if the national baseline anticipates a 1% annual improvement in energy efficiency, yielding 2010 emissions well above the Kyoto target, and a company takes actions that yield only a 0.5% improvement in its energy efficiency, does the company get a "credit" for such action, or does it get a "debit" for failure to take enough action to preserve the national baseline?)

If to avoid such problems, the idea is to recognize just about every action that is taken that contributes to reduced emissions relative to a base case only of that action not being taken, then we are contemplating a huge, elaborate bureaucratic process to register and verify a myriad of individual actions that are truly part of "business as usual". This invites an unprecedented and alarming level of government scrutiny and oversight of individual energy using decisions by enterprises. It creates a whole new level of micro-management by government of the economy.

It is not a counter argument to say that registration of such actions is voluntary. The wider the definition of allowable or recognizable actions, the larger the number of likely applications and the greater the necessity on any firm to register anything it possibly can while the end target remains fixed at 563 MT.

It also creates enormous potential for game playing. Recognized actions have potential future monetary value in such a system. There are significant prizes for those who can have the most and the largest actions realized. And the prizes are most likely to go, not necessarily to those who make the greatest reductions, but to those who make the best bureaucratic case for recognition of actions they would have taken ordinarily.

This represents to us, an unacceptable situation.

CEA circumvents the overall goal of the current national process

The objective of the current national process has been to identify what would be required for Canada to meet the Kyoto target, and what the economic impacts would be. This would allow Canada to make an informed decision about possible ratification. It was also to provide some insight into what a future possible regulatory regime would have to be. The process of assessing the implications of imposing severe restrictions on carbon energy use in 2008-2012, and how they might be imposed and enforced if necessary, is best served by focusing on just that.

On the other hand, credit for early action is about providing "credit" or recognition in some future regulatory regime - and the more uncertain that future regime is the harder it is to intelligently consider an advance system for it. Given that there is no national benefit or compelling case to have a CEA system, and trying to design one potentially limits the options available for any future regime, a preferred course would seem to be to concentrate on designing the post-2008 regime.

If the decision of this process turns out to be that Kyoto should not be ratified, then there is no value in a CEA system. Even with a decision to proceed with Kyoto implementation, a CEA system would be unfair, and would detract from Canada's efforts to implement its strategy optimally.

References

1. Rolfe, Chris, Staff counsel, West Coast Environmental Law; "Credit for Early Action and Baseline Protection - Issues of Immediate Concern", March 21, 1999

2. Lewis, Marlo Jr., Vice President for Policy and Coalitions, The Competitive Enterprise Institute; "Early Action Crediting: Growing the Kyoto Lobby at Small Business' Expense", February 12, 1999

A3. Minority Opinion of the Aluminum Association of Canada re Rationale for Credit for Early Action

"Doing nothing is not an option!"

In his appearance before the Standing Committee on Natural Resources and Government Operations on 17 February 2000, David Oulton, head of Canada's Climate Change Secretariat, explained that the question is not whether emissions will have an impact but what the implications and timing of the impact will be. Oulton clarified that the goal of the national strategy is to put forward prudent recommendations that do not destroy industry. He stated, "it has been decided doing nothing is not an option."

While Canada's response must reflect political and commercial realities - both domestic and international, inaction would fail to equip Canada with the requisite tools to meet the challenge of what will be a critical period in the evolution of international trade conventions.

Canada must position itself as a leader on key issues, such as flexibility mechanisms and domestic implementation strategies, if we are to have any hope of addressing our specific circumstances in the current international debate or on any subsequent international initiatives (post Kyoto Protocol).

Kyoto Protocol is inadequate and only a short-term compromise.

Global warming is a long-term issue. IPCC scientists have indicated that a 50 per cent reduction from 1990 levels is needed if the current increase in GHG concentrations is to be limited to only a **doubling** of the pre industrial concentrations. While ratification even of the Kyoto Protocol is not assured, it aims to reduce Annex B Parties emissions by a mere 5.2 per cent. Therefore, it must be viewed as a small down-payment toward limiting emissions to levels that would prevent potentially dangerous anthropogenic interference with the climate system.

The Kyoto Protocol does not address growth internationally and may inadvertently promote increased emissions by shifting production to regions that are not constrained. At present, people in the developed world consume 6.8 times the energy of those in the less developed countries. It is estimated that by the year 2025, developing countries will be responsible for 68 percent of all energy related CO_2 emissions. The foregoing underscores the US Congress call for global participation in curbing these emissions.

Flexibility Mechanisms are a must!

Developing countries must take a quantum leap up the experience curve to prevent the use of less efficient technologies and infrastructure to support their production goals. Flexibility mechanisms will play a crucial role in the development of effective policies to promote reduced GHG intensity in both the developing and developed world. Emissions trading is a cost effective instrument to reduce emissions and, therefore, a necessary component of any mitigation strategy.

However, to support widespread use of **JI, IET, and CDM** initiatives, the fundamental design of the trading program must embrace the political reality that some parties to the UNFCCC have not accepted and may never accept, "absolute" caps on their emissions.

Industry is only part of the solution

As noted elsewhere in the Industry Table Overview, Canada is projected to have a gap of 26 per cent, equalling an annual 199 million tonnes of CO2 equivalent (projected annual emissions of 764 MT vs. an average annual Kyoto Protocol requirement of 565 MT), which must be achieved in order to meet its Kyoto Protocol commitment. Industry accounts for only 33 per cent of

Canada's total GHG emissions. Industry emissions are roughly equal to the entire liability Canada will have to address.

Measures that engage all components of the Canadian economy are necessary. Those measures must, however, ensure that Canadian industries have a basis for effective risk management in any proposed GHG management policy framework to remain competitive, internationally. Assuming that actions are justifiable under prevailing economic and market conditions, encouraging action sooner results in lower overall costs of reducing GHGs.

Current efforts are inadequate

Canadian governments must establish a basic framework under which such substantive early action can take place. Efforts to date, including the current formulation of Baseline Protection, as well as the two CEA pilot proposals referred to as the "Bristol" and "Covenant" approaches, fall short of providing this basic framework and simply support continued effort on a 'business as usual' path.

In the aftermath of the Credit for Early Action Table deadlock, a Collaborative (composed of ENGO, industry and government officials) presented government with a proposed approach to the development of an effective system - Canadian Early Emissions Reductions Program. While incomplete in some critical policy elements, it provides the most comprehensive approach, yet, to address existing domestic and international design issues:

- providing a mechanism to achieve the long-term goal of limiting the build up of atmospheric concentrations of GHGs to a doubling of pre-industrial levels;
- accommodating growth without absolute limits;
- encouraging board-based engagement beyond the industrial sector.

Conclusion

Members of the Aluminum Association of Canada (AAC) believe there will be some form of carbon constraint in the future. The weight of scientific evidence increasingly supports the hypothesis that global warming is real and that human activity is contributing to increased global warming.

AAC Members believe that focussing on long-term solutions that accommodate growth and enlist broad participation must be central elements in the Canadian National Implementation Strategy. Gaining valuable experience with the early implementation of such a strategy will help to position Canada effectively in future rounds of negotiations on the UNFCCC – including looking beyond the first budget period.

AAC Members believe that any GHG management approach requires the development of an infrastructure to measure, monitor, verify, allocate, arbitrate and address policy issues. It is essential that Canada develop the requisite policy framework, including an effective CEA program, within which Canadian industry and other parts of the Canadian economy can take immediate positive action.

The AAC members support the CEERP proposal and with other Collaborative members offer to work with government officials and other interested industry and ENGO representatives to improve it. They urge government to proceed with its development, expeditiously.

AAC Members and other corporate emitters are prepared to identify and address the issue of reducing GHG emissions immediately, and will be able to do considerably more, provided governments put in place the requisite framework to encourage such actions.

Shortcomings of the current proposals for Baseline Protection and limited CEA (Bristol and Covenants)

The following assessment of the current Baseline Protection (BP) and Credit for Early Action proposals demonstrates why they do not encourage meaningful early action.

Current Baseline Protection proposal

- it gives the *same* protection to entities that take positive steps now / in near future to reduce GHGs, as to those that wait until such steps are mandated

- the alleged 'simplicity' of the BP proposal is contradicted by the need for 'real, measurable, verifiable and incremental' aspects of any climate change initiative

- if there is to be sufficient scrutiny to ensure legitimacy; then, there will be attendant costs for both the entity and the agency responsible for administering BP (without any reward – only the minimisation of future potential harm). This would deter companies from registering under the proposed plan

- the choice of the registrar – thus far the VCR has not demonstrated the technical capability to determine whether the submissions it receives are consistent with the requirements of 'sufficient scrutiny' and 'legitimacy' and to ensure the registered initiatives are 'real, measurable, verifiable, incremental', etc.

- uncertainty is perpetuated regarding taking additional action to reduce GHGs due to the postponement of assessing the validity of claims made under Baseline Protection (since the proposal is to require only the filing of summary information at the moment). Consequently, it will be impossible to determine whether all reductions claimed will be recognized

- it does nothing to discourage increased emissions, since allocation of responsibility is not defined (including the time which may be referenced to establish a baseline) and there is no certainty of future policy requirements. Thus, from an individual emitter's standpoint, the benefits of inaction include:
  - no immediate competitiveness constraints;
  - possible larger allocation in the future, since there has been no indication of what time an allocation would reference for apportionment to emitters (thus larger future emissions, a larger portion of the inventory) could translate to a larger future portion of the allocation – coupled with the possibility of easier initial reductions, since no steps had been taken to make basic reductions in emissions that other sources may already have made

Bristol CEA Pilot Proposal

- it does not provide any recognition of past actions to reduce GHGs – to accept this would indicate a willingness on the part of any participating entity to forego recognition of such past action. Failure to acknowledge previous action would result in an entirely perverse reward for those who had not taken any (or less) action, compared to entities that had implemented progressive GHG reduction measures, as early as possible

- discounting credits decreases the value of this proposal

- its reliance on GERT / PERT programs reduces the technical credibility of the proposal and further increases the uncertainty of its value, particularly since both GERT and PERT rely on volunteer assessments of specific proposals. Thus, there is no guarantee of proper and qualified evaluations of initiatives

- no allowance for handling growth is indicated

- uncertainty is again increased as no assurance is given that future treatment of a participating entity, under other GHG reduction oriented policy measures, will be protected, despite the greater degree of openness and increased detail of information provided

- the two year limitation on the proposal reduces certainty and significantly diminishes the proposal's attractiveness to entities that have longer term objectives and strategies

Covenants CEA Pilot Proposal

- it does not provide any recognition of past actions to reduce GHGs – to accept this would indicate a willingness on the part of any participating entity to forego recognition of such past action. Failure to acknowledge previous action would result in an entirely perverse reward to those who had not taken any (or less) action, compared to entities that had implemented progressive GHG reduction measures, as early as possible

- 'rewarding' participating entities by purchasing the reductions does nothing to address the uncertainty associated with possible future GHG reduction policy measures

- 'purchasing' such early reductions in no way guarantees any reduction in the future, including in the Kyoto Protocol commitment period

- reliance on GERT / PERT programs reduces the technical credibility of the proposal and further increases the uncertainty of its value, particularly since both GERT and PERT rely on volunteer assessments of specific proposals. Thus, there is no guarantee of proper and qualified evaluations of initiatives.

- requiring that "… governments seek the most feasible PACEs from entities and sectors …" amounts to ensuring that the 'lowest common denominator' is encouraged / it appears that only the least cost options may be accepted – as opposed to encouraging the most promising reductions that will reduce the largest amount of GHGs overall

- the two year limitation on the proposal reduces certainty and significantly diminishes the proposal's attractiveness to entities that have longer term objectives and strategies

APPENDIX B – LINKAGES TO OTHER TABLES

The Industry Table believes that many of the issues being considered by the other issue tables in the national process will in one way or another have some influence on Canadian industry's ability to effectively manage greenhouse gas emissions. The technical actions and policy measures proposed by several of the tables in particular are of interest.

The Table has had only limited opportunity to review the conclusions and recommendations of other tables**. Ideally, we would have preferred to conduct more detailed analysis of a few of the most significant measures that directly affect key industry sectors, and we hope that this may still be possible as part of the national climate change consultation process.** Nonethleless, at this point in time some preliminary observations are appropriate with regard to nine of the other tables.

1. Electricity Table

For many industry sectors, electricity is a key input. Reliable and relatively low cost electricity will be critical to their competitiveness. The location of the aluminum industry in Canada has much to do with the availability of large supplies of relatively low-cost hydroelectricity. Some companies in the chemical sector have 60% of their costs in electricity and are exporting most of their product to the US. Higher rates than those available in the United States could move those companies south of the border. Thus the Industry Table is quite interested in the policy options being examined by the Electricity Table and the impact which a carbon-constrained world might have on electricity pricing in Canada and on the energy advantage that Canadian based companies traditionally have enjoyed.

Deregulation and increasing competition in electricity supply could be quite beneficial to Canadian industry if the transition is smooth and reliability and price are not adversely affected. So too could removal of current barriers to interprovincial trade in electricity, which could allow electrical utility generators and other energy providers to offer lower cost options.

A further opening up of the North American electricity market also should permit industry sectors to develop cost-effective co-generation projects that would lead to make better use of excess heat and steam in their facilities, and in some cases supply power to the grid. This could enable companies to reduce their GHG emissions and at the same time improve their competitiveness. It is important that existing regulatory, financial and market barriers be removed as quickly as possible to allow industry to take advantage of these opportunities. At this critical juncture in the development of Canada's national climate change strategy, policy signals from government should be clear with respect to encouragement of co-generation.

While Canadian industry is anxious to see new supply of competitively priced power come on the market, it also recognizes there are a number of uncertainties related thereto. As identified in the Electricity Table Options Report, a number of other policy decisions and market factors beyond immediate climate change considerations affect decisions about changes in the mix of fuels and generating options. Some types of low or non-emitting generation face long lead times for approval and construction of facilities. Industry is anxious to see the delays and costs associated with such decisions minimized, and to see power generators able to maximize least cost options, since as customers they will ultimately pay the price if such is not the case. As well, there is the problem of stranded assets if existing low cost generating units are retired before the end of their economic life, which must be paid for by taxpayers in the case of public-owned utilities and/or by the utility's customers.

In the medium term, one important result of addressing emissions in the electricity sector could be a significant switch to natural gas as a generation fuel both in Canada and the United States.

From the perspective of the sectors represented at the Industry Table, there are three key implications: 1) a decidedly negative economic impact on the coal industry; 2) increased GHG emissions for Canadian natural gas producers and pipelines; and 3) significant upward pressure on natural gas prices with negative implications for industrial users of natural gas, e.g. chemicals, automobile manufacturing.

Finally, the Electricity Table has identified emissions pricing as the most efficient mechanism to reduce emissions to the Kyoto target in the commitment period. Whether undertaken through an emissions trading scheme or by means of a GHG tax, emissions pricing applied to electricity generators would significantly raise the cost of electricity for industrial consumers. The impact on price could be somewhat less in a competitive electricity supply market than in a situation of an electrical utility monopoly. Nonetheless, the resulting change in electricity prices in a carbon-constrained world, even using the most efficient policy instrument, is likely to have a considerable impact on the competitiveness of major industrial consumers of electricity. This would be especially so if similar charges were not applied in the United States, our other major trading partners and competitors.

2. Transportation Table

The cost, efficiency and availability of transportation services have a substantial impact on Canadian industrial competitiveness. Canadian industries move goods over considerable distances – carrying products overland to markets throughout North America; moving goods to distant ports for shipment overseas, and transporting raw materials from remote locations to processing facilities. For many industries, freight transportation remains a significant cost. For the logging, forestry, sawmills, and coal industries, transportation costs account for 5% of total input costs. On the basis of tonne-kilometres carried, rail remains the dominant freight mode. For exporters, low freight transportation costs are essential. For example, the transportation costs of moving goods to their final destination account for as much as 35.6% of costs in the case of coal mines.

While for-hire trucking currently accounts for only 27% of tonne-kilometres, it is the fastest growing mode for freight transportation. The rapid growth of the trucking industry is a result of two factors: the expansion of the services industry; and the increasing use of just-in-time delivery by secondary and primary manufacturing sectors. As well, trucking assumed a greater role in the transportation of goods across the border to the United States with the launch of NAFTA. Heavy-duty trucks and buses emit 20% of Canada's transportation-related greenhouse gas emissions. Currently, rail emits only 4% of such emissions.

Maintaining an efficient transportation system is crucial to the productivity and competitiveness of industrial sectors relying heavily on transportation services. Moreover, inefficient and inadequate transportation systems will create traffic crowding and pollution problems.

Competitive pricing, availability and reliability of transportation and freight are critical factors which may determine an industry's future in Canada. The measures proposed by the Transportation Table will be carefully considered in light of their potential impact on industry. In particular, the table will want to examine any measures which could increase the price of transportation services compared to what competitors in North America and other parts of the world face. As well, the table will pay attention to measures such as changes in transportation infrastructure that would affect the ability of Canadian industry to deliver products to customers or receive inputs from suppliers in a timely manner.

3. Technology Table

The Industry Table is interested in reviewing the list of potential technologies and working with the Technology Table to better define the potential of some key technologies in major industry

sectors. Nonetheless, many of the technologies identified by the Technology Table are more future-oriented than what many sectors are focused on today. Some are unlikely to be of significant use or reach significant levels of penetration until after the Kyoto commitment period. An example would be fuel cell technology as motive power for automobiles. There are substantial technical and economic obstacles before fuel cells would begin to appear in new vehicles and become widely accepted in the marketplace, let alone the 15 to 20 years it would take for most of the vehicle stock to turn over.

The significant challenges of meeting greenhouse gas reduction targets may present new business opportunities for segments of Canadian industry, especially those involved in environmental goods and services. To this extent, Canada can take advantage of the "double dividend" of improved environmental and GHG reduction performance coupled with benefiting from enhanced commercial opportunities. Even in more traditional industries, there could be opportunities for some companies to move from acquisition of technology through imports and other traditional vehicles toward a much earlier involvement in the innovation process. The Technology Table has recommended that Canada implement policies and governmental investments to support all stages of the technology innovation cycle so that the country can be a bigger player in the market.

The Industry Table also is interested in the overall policy framework that will support innovation, technology development and deployment related to climate-friendly technologies. A few ideas in this area can be found in the recommendations contained in chapter 4.

4. Public Education and Outreach Table

Since most of the human-induced emissions of greenhouse gases occur as a result of energy use, meaningful reductions in Canada will only happen if the Canadian public becomes convinced that all segments of society need to work together to alter their patterns of energy consumption. There are a number of steps which Canadians can and should take to improve energy efficiency in the home and on the road. And many of these opportunities would pay for themselves. However, information about those opportunities often is lacking, as are the incentives that might make those “win-win” opportunities more attractive to consumers.

However, energy savings alone are unlikely to prove a significantly powerful motivating factor for most Canadians, especially where many energy efficiency investments will require a substantial upfront investment that will be returned only over many years (for example enhanced insulation in homes, purchase of high efficiency furnaces and appliances). Equally important, lifestyle and convenience are powerful determinants of individual behaviour and often outweigh considerations of reduced energy costs. Operating in a carbon-constrained world would of course strengthen that incentive since energy is likely to be much more expensive. But Canadians would still require significant lead time to change their consumption patterns and invest in a new stock of higher efficiency automobiles, homes and appliances.

Canadian industry has a role to play in educating its customers, employees and other companies about responsible action related to climate change. The SME sub-table report identifies a number of ways in which larger companies can motivate action by their SME suppliers to address greenhouse gases. In addition, CIPEC and the VCR constitute important networking and outreach programs whereby industry leaders can influence the actions of their peers. And as outlined in this report, there are many positive examples of progress by industry in reducing emissions that need to be brought to the attention of Canadians. These can be helpful in demonstrating to Canadians that through commitment and innovation, and with a supportive public policy framework, it is possible to make progress on environmental and economic goals at the same time.

Public education and outreach efforts need to inform Canadians about the science and economics of climate change. The work of the PEO Table has further illustrated that climate change is a

difficult and complex topic to communicate in a relatively straightforward fashion. The uncertainties about the causes, magnitude and impact of potential risks to our climate system are significant and unlikely to be resolved for some time to come. And the benefits of preventing changes to the climate system are often remote from Canadians, at least in comparison to the very direct costs they may be asked to assume.

The federal and provincial governments need to continue and expand their efforts at public outreach. Like other major public education efforts aimed at real changes in consumer behaviour, this will require several years and significant public resources. Accordingly, the strategy needs to focus on cumulative steps and reinforcing messages, and on initiatives that can achieve maximum impact for dollars expended.

Public education should focus on:

- Reasonably comprehensive and comprehensible explanation of the science surrounding climate change;
- Balanced information on the environmental and economic risks of climate change and the costs and benefits of reducing greenhouse gas emissions;
- Ensuring Canadians understand the link between consumer demand and energy consumption;
- Practical advice on the actions Canadian can and must take to reduce their GHG emissions;
- Providing success stories about businesses, municipalities and institutions that have made strides in limiting emissions.

5. Credit for Early Action Table

The Industry Table has been intently following the debate on Credit for Early Action (CEA), including the deliberations of the Credit for Early Action Issue Table. More recently, it has discussed the proposal by federal and provincial governments to establish a scheme of "baseline protection" as the first phase of a CEA system, and the proposal by the Canadian Early Emissions Reduction Program on yet another option for CEA.

The Table believes that credit for early action will be a critical test of Governments' ongoing support of industry efforts to address climate change, particularly as it relates to the equitable treatment of past actions. In good faith, Canadian industry has taken positive actions to reduce its emissions of greenhouse gas actions through the previous National Action Program on Climate Change and programs such as CIPEC, VCR and EcoGeste. In the absence of such an assurance, the momentum that has been critical to the success of these voluntary programs could easily be lost.

The Industry Table notes that the purpose of a CEA system should be threefold:

- to provide sufficient and appropriate incentives to bring about early (pre 2008) reductions in greenhouse gas emissions
- to ensure no disadvantages for past actions undertaken as voluntary efforts to address climate change; and
- to preserve the momentum behind current voluntary greenhouse gas programs.

Concerned about the direction being proposed for CEA, the Industry Table submitted a position paper[18] on this topic to the Climate Change Secretariat in spring 1999. The paper outlines a number of key principles which should form the basis of CEA, including:

- Baseline protection is a necessary, but not sufficient step, to provide meaningful incentives for early action.

[18] The position paper was supported by the majority of Table members, but two members chose to file minority opinions.

- The rules governing baselines will be key and should be flexible enough to accommodate growth in a participant's business. In a case where compliance with other regulatory requirements causes an increase in a participant's greenhouse gas emissions, appropriate adjustments to the baseline will have to be made
- The key test of whether a credit is granted should be performance in terms of measurable and verifiable reductions, not the intent of those taking the action.
- Rules should be developed to allow carbon sequestration activities and projects undertaken outside Canada to be eligible.
- With regard to past versus future actions, actions that meet the same level of rigour (measurement, reporting, and verifiability) should receive the same credit.
- Governments should carefully consider the rules pertaining to the use of credits against a potential future obligation - including the feasibility of limiting available credits to some percentage of the overall target.
- Every effort should be taken to ensure that CEA rules are consistent with those that are eventually developed at the international level. Consideration could also be given to expanding Canada's "assigned amount" of Kyoto credits through the purchase of credits internationally (the Clean Development Mechanism, Joint Implementation, International Emissions Trading) and thereby partially underwriting the CEA credits.

6. Kyoto Mechanisms Table

The Industry Table views the Kyoto mechanisms (Clean Development Mechanism (CDM), Joint Implementation (JI), and International Emissions Trading (IET) as opportunities to address climate change by taking advantage of lower or least cost reduction opportunities in other parts of the world. However, the rules for these mechanisms are still subject to protracted international negotiations. The degree to which the Kyoto mechanisms can support Canadian industry's efforts to address climate change depends upon the exact nature of the final agreement.

CDM and JI are project-based mechanisms that assist countries with commitments in achieving their Kyoto targets by allowing them to obtain emission reduction credits from projects located outside of their borders. CDM projects would occur in developing countries and in addition to reducing GHG emissions, they must also contribute to the sustainable development of the host country. JI projects would be undertaken in industrialised countries that have committed to GHG emission targets.

Supplementarity

According to the Kyoto Protocol, a country's use of the Kyoto Mechanisms is to be "supplemental" to domestic actions to control GHG emissions. One of industry's main concern is the proposal by the European Union to place a "cap" on the extent to which countries can make use of the Kyoto mechanisms to assist in achieving their greenhouse gas targets. The Canadian government has consistently opposed a cap on the basis that it would increase compliance costs and complicate domestic implementation, and the Industry Table generally supports this view.

Fungibility and Competitive Access

Industry is looking for assurances that reductions accrued through the Kyoto mechanisms are fully fungible. In other words, parties should be able to trade credits accrued through any mechanism with any other legal entity. Competitive access to the Kyoto market should not impeded by monopolistic pricing behaviour or anti-competitive bilateral deals. To date, the Canadian government has supported the principle of competitive access to all Kyoto mechanisms.

Sinks/Carbon sequestration

The Kyoto Protocol recognizes efforts to enhance carbon sequestration as a legitimate means of meeting climate change commitments. Key issues that remain to be negotiated include agreement on the definitions of terms – namely "afforestation", "deforestation" and "reforestation", and the eligibility of projects that would sequester carbon in soils. Given Canada's abundance of agricultural and forest land, our position is that credits should be granted for both agricultural soils and forest lands, and that we should continue to work actively to promote international agreement on rules and methodologies that will serve Canada's long-term interests in these issues.

International Emissions Trading (IET)

There are a number of key elements to ensure the viability of international emissions trading:

- The overall framework for IET must be environmentally and commercially credible.
- Monitoring and reporting system must be effective and transparent.
- The system should be market-based and use existing financial/commodity market institutions and mechanisms to the maximum extent possible.
- All legal entities should be able to participate on equal terms.
- Transaction costs should be minimized.
- In order to ensure smooth functioning of an eventual emissions trading market, liability for failure to deliver the contracted reduction units must rest with the seller.
- Clear rules and penalties for non-compliance are required.

Canada should work actively to develop its thinking on a consistent and compatible regime of domestic emissions trading, in parallel with the negotiations on international emissions trading. If an international trading system does develop, there is a need to ensure that Canadian firms active in the international market have their actions accounted for on a one-to-one basis and recognized for purposes of any domestic obligations.

Canadian Priorities re Kyoto Mechanisms

Given that the rules and modalities governing the Kyoto mechanisms are still under discussion, businesses throughout the world face considerable uncertainties about the kinds of projects that will qualify and indeed whether the mechanisms will be market-oriented, transparent, and provide full access to lower cost reduction opportunities. This uncertainty makes investment decisions difficult for those Canadian firms who are interested in pursuing international offset opportunities, and hinders the process of assessing the merits and respective costs of domestic and foreign projects. In this respect, rapid development of the rules with respect to CDM are particularly important, since credits from CDM projects can begin accumulating in 2000.

As the rules for the mechanisms are being elaborated, it is imperative that Canadian industry representatives be fully involved and consulted on ways to make the mechanisms effective and efficient. While safeguarding the environmental and economic credibility of the mechanisms, the federal government should also ensure that the rules for the mechanisms permit maximum flexibility to Canadian industry in pursuing reduction and sequestration opportunities.

The Canadian government can take steps to facilitate Canadian industry participation in the mechanisms:

- Provide clear policy direction that credits obtained internationally will be recognized against any domestic obligations that might subsequently be imposed (tied to credit for early action);
- Provide information on potential JI and CDM opportunities to Canadian business;
- Strengthen relations and develop cooperation arrangements with developing countries where promising opportunities may exist, and assist in streamlining the approval process in such countries.

7. Tradeable Permits Working Group

At this point, the Industry Table has not had an opportunity to review even the preliminary output of the Tradeable Permits Working Group (TPWG). The TPWG is examining the options for a "cap-and-trade" type scheme of emissions trading during the Kyoto commitment period. While governments have indicated that the commissioning of this work does not imply a preference for this particular policy option, the Industry Table has a number of observations and concerns that it wishes to express at this point.

First and foremost, most Table members are extremely concerned about the achievability of the Kyoto target for Canada. Whether or not emissions trading may represent the most efficient means to achieve the Kyoto objective, the target itself poses substantial economic risks for Canada, its energy intensive sectors and for our standard of living.

Analysis of the Kyoto target by several sub-tables, whether through the means of emissions trading or by imposition of a carbon tax, gives some approximation of the economic impact of meeting that objective. *(See results of oil and gas, petroleum refining, chemicals, etc.)*

Creation of an emissions trading scheme may provide governments with considerable revenues to recycle back into the economy (either because permits are auctioned or because governments in one way or another would recover the economic rents created if there is a "gratis" allocation of permits). Many members are skeptical of the ability of governments to efficiently and fairly effect this re-distribution.

We understand that one or more of the options being examined would involve only partial coverage of GHG emissions within the trading scheme. Accordingly, it will be extremely important to examine how the trading scheme would interact with complementary policies for the non-covered sources so as to ensure a similar level of effort and that the burden of achieving the emissions objective is distributed equitably amongst all sources.

8. Enhanced Voluntary Action Table

The Industry Table is pleased to see the focus of the EVA Table is very much on improving the scope, credibility and effectiveness of voluntary programs in order to contribute to Canada's climate change objectives. Given the millions of individual sources of GHG emissions in Canada, it is our view that meaningful progress on climate change could not be accomplished by government regulation alone.

Members of the Industry Table are among the most active participants and supporters of current voluntary programs that address a wide range of environmental issues. In the climate change context, members participate actively in the Canadian Industry Program for Energy Conservation, the Voluntary Challenge and Registry, and EcoGeste. As well, a number of voluntary, sector specific environmental programs address greenhouse gas emissions as part of a more comprehensive program of monitoring and controlling emissions in a wide range of industry sectors. Industry believes that with appropriate goals and procedures, voluntary programs can be an effective and efficient means to bring about continual environmental improvements, and in a way that also contributes to the firm's and society's goals for economic growth, productivity and competitiveness of the Canadian economy. Voluntary programs can often achieve environmental progress more quickly and at less cost than a traditional command-and-control approach, because they can stimulate innovation and creativity, and allow choices to be made by those who know their operations best.

We agree with members of the EVA Table that notwithstanding considerable progress to date, there is a need for strengthening and expansion of current voluntary efforts to improve both coverage of emissions sources and their effectiveness. There are significant components of society that do not now actively participate in efforts to moderate GHG emissions, and there is a

need to devise new programs that can enhance their participation. As well, there is a need to share experiences with a view to improving existing programs. And governments and industry need to address current criticisms of existing voluntary programs. Improvements are needed that will ensure the credibility of voluntary efforts, to address realistic goals and means to measure achievements. Enhancements are also needed to reporting and monitoring systems. Having said this, we also believe that many voluntary programs have been unfairly maligned, and their successes poorly understood and communicated. And while rigour and credibility are important, rules for voluntary programs should not be so onerous that they inhibit creativity or discourage broader participation.

We agree with the EVA Table that there is a significant number of different types of voluntary initiatives and we should be seeking out the most effective and appropriate to apply in a given situation. The Table has identified a number of the most critical components for successful voluntary programs, including: 1) clear, measurable objectives; 2) provisions for continuous improvement; and 3) measurement and reporting procedures that produce verifiable results. For their part, we believe companies and industry sectors should continue to show leadership in voluntary initiatives by: 1) strengthening and expanding existing programs; 2) setting emissions reduction and/or energy efficiency targets; 3) tracking emissions and reporting on progress; 4) sharing best practices; 5) engaging in training and awareness programs; and 6) working with external stakeholders to broaden support for voluntary programs.

We agree with EVA Table members that a conducive public policy framework is essential to support voluntary climate change initiatives. Among the most important elements are: 1) clear signals that voluntary is a legitimate and necessary part of the national climate change strategy; 2) leadership through government stewardship initiatives; 3) recognition of action through baseline protection and similar mechanisms; 4) resources to support voluntary efforts, including training and public awareness programs; 5) technology support programs; and 6) incentives and market enhancement policies.

9. Buildings Table

The Buildings Table's analysis of the Commercial/Institutional (C/I) sectors lead to the development of two Options Packages of measures. The Comprehensive Options package, which is based on all 19 measures developed during the Measures Development Phase of the Issue Table Process, achieves -8% of 1990 emissions by 2010. A smaller Targeted Options package was also developed which would deliver slightly below the Kyoto target at -5%. The analysis found that both packages would result in net savings rather than costs in achieving their respective GHG reduction levels: at $7 and $4 per tonne of GHG reductions respectively.

Industrial buildings use similar space and water conditioning, lighting and auxilliary equipment, including fans and motors, as other buildings. Therefore measures could be developed that would apply to industrial buildings with similar costs and returns on investment as developed for C/I buildings. Examples of such measures are:

> Building Retrofit Program - integrated retrofit program comprising information, partnerships and financial incentives; and
>
> New Building Incentive Program - an incentive and design community education program to push new building design 25% beyond existing codes.

Both of the above measures could have important impacts on the GHG emissions of existing and new buildings within the industrial sector. Other measures could be developed to address equipment demonstrations, equipment and buildings labelling, commercialization and promotion of EE equipment and operator training.

In addition, several Buildings Table measures will have a direct bearing on emissions within the industrial sector because they relate directly to energy-using equipment used in all sectors. Examples of such measures include:

National Standards Program for Equipment and Appliances, (A-E1) - prescribed minimum EE standards for EE equipment and appliances; and

Energy Efficiency Equipment Tax Measures (C11)- faster write-offs for capital costs of EE equipment and/or exemption from GST/PST/HST.

APPENDIX C – FIVE PRINCIPLES

As noted in Chapter 1 above, in developing its foundation paper the Industry Table originally adopted five principles to guide its work, and against which technical and policy options would be judged. These are reprinted below.

Industry must be part of the Climate Change effort

Industry is rolling up its sleeves to work on the challenge of Climate Change. It is a global issue with a national dimension - well beyond the scope of solutions put forward by industry alone. In Canada, it must be recognized that all sectors of society contribute to GHG. Positive efforts to address the issue require all sectors of the economy and society to do their fair share to meet this challenge. Industry should be expected to work towards solutions to the Climate Change challenge as part of a cooperative effort by all sectors of Canadian society. Industry should have a clear idea of the direct and indirect impacts of operations on greenhouse gases, and potentially on Climate Change. Specifically, as part of the broad Climate Change effort industry should:

- Identify economic opportunities for improvement and have plans to reduce GHG through energy efficiency and other initiatives such as changes in operations;
- Strive to use cost-effective technologies to reduce GHG and encourage changes in related industries and sectors and consumers attitudes/behaviour to achieve improvements;
- Be committed to using imagination, innovation and expertise to find new ways of doing business that can help Canada meet the Climate Change challenge over the short and long term; and
- Ensure transparency in reporting GHG emissions, how operations or products impact on this issue, and the extent of efforts being made to address this issue.

Climate Change initiatives must support a growing and productive economy which is essential to the quality of life of Canadians

The health and competitiveness of Canadian industry is critical to the standard of living of Canadians. To contribute to the Canadian economy, companies have to be able to expand, to innovate, to invest and to change in response to competitive pressures internationally and domestically.

The ability of a country to produce a high standard of living for its citizens depends to a large extent on economic productivity. Concerns have been expressed about Canada's rate of productivity growth and the sustainability of our economy. Initiatives to address GHG should not aggravate these problems. To meet the competitiveness and productivity challenge, Canadian industry must efficiently produce products and services using the best combination of labour, capital, innovation, marketing energy, transportation etc.

Unless Climate Change initiatives aim to reduce GHG while maintaining and encouraging a growing, competitive, productive and innovative Canadian industry, they will be ineffective and not sustainable. In short, governments, Canadians and industry should:

- Aim for the win-win on Climate Change - maintaining and encouraging economic growth and productivity while reducing GHG emissions.

Canada must try to make the market work for greenhouse gas reduction

The market is a powerful driver of change. The challenge of Climate Change is already affecting how companies behave. Even though there are limitations as to how fast new technology can be implemented, market forces are continually working to improve energy efficiency and reduce costs.

Business has been engaged in reducing energy costs and improving efficiency for many years and has made a lot of progress. Some examples are the effective use of waste as by-products, using

off-gases in affiliate industries, and the development of improved processing. These initiatives mean a cleaner environment, less greenhouse gas emissions and reduced costs.

There is no doubt that there is room for further improvements in energy efficiency and emissions. The questions that remain are in terms of how much, how fast and at what cost.

Given the global and societal nature of the greenhouse gas issue, it will be very difficult to develop effective regulatory approaches to this issue. Government can help by providing a positive and realistic framework within which all Canadians, including industry, can work towards reductions in greenhouse gases, while recognizing the domestic and international economic objectives of our country.

Preference should be given to policies or initiatives which build on what business has been doing and reinforce the competitive drive of companies to reduce costs, increase efficiency and be market leaders in Canada and the world. Climate Change initiatives must recognize that markets are global and supporting policy should ensure that Canada's economy is open to, and competitive in, international markets.

The key actions that should be taken so that this can be achieved are as follows:

- Government should focus on the overall results to be achieved by all sectors of the economy and recognize the limitations of specific targets for specific sectors in a highly interdependent economy;
- Targets for greenhouse gas improvement should be based, in part, on emissions per unit of output rather than solely on total emissions, in order to avoid constraints on growth and industrial renewal;
- Preference should be given to policies which lower costs as well as addressing greenhouse gas issues (this would mean, for example, a preference for policies based upon incentives rather than taxes);
- If governments consider positive financial incentives and tax credits, they should work to understand the direct and indirect impacts of such initiatives;
- Policies or institutional barriers which impede energy efficiency, recycling or investing in new technologies should be reduced; and
- Initiatives with respect to any given sector should take into account the interdependence of Canadian industry and international linkages. These initiatives should be assessed for their impact on related sectors, upstream and downstream and aim to create a level playing field for all sectors.

Canada must have a level playing field with other countries in terms of trade and competitiveness and contribute to global solutions

Climate Change is a global issue which requires global action. Approaches which include only some countries, or which do not sufficiently take into account the realities of our country (e.g. growing population, resource-based, large distances to cover, and cold) will inevitably disadvantage Canada's trade position and fail to deliver intended results.

The Climate Change challenge can also offer opportunities for Canadian companies to develop approaches to manufacturing or technology that could increase our competitiveness and provide new markets. Canada should take maximum advantage of opportunities to market technologies or manufacturing/ management processes to provide global solutions for GHG reduction.

Canadian industry competes against the world in both domestic and export markets. If action taken for Climate Change objectives increases costs so that Canadian firms cannot compete, the result will be to transfer market share to foreign companies at a loss of Canadian wealth and jobs. If this was to be the case it is likely that no gains to the environment would be realized. Resource exports are extremely price sensitive. Canada is competing with many other countries to export

resources. As we have seen recently, changes in the value of currencies in Asia and Russia can have a dramatic impact on our competitiveness in that market and the value of our own dollar.

As a country that is more dependent on trade than most others, major cost increases of commodities will have a major negative impact on growth, the dollar and other key economic indicators. The competition for capital and for return on investment is a global market. To be sustainable, companies have to be able to attract a continuous flow of investment capital.

Industries or companies which face a major cost adjustment problem in relation to Climate Change will inevitably face difficulties in the capital markets. It also has to be recognized that when economic activity shifts from Canada to other countries (particularly those not involved in the Kyoto agreement), the net effect could be greater greenhouse gas emissions.

Climate Change actions should be pursued to ensure that Canadian initiatives work to the advantage of Canada's trade position relative to other countries. The key actions that should be considered are as follows:

- Canada, along with many other industrialized countries should take a leadership role in addressing this issue, however, we should be able to demonstrate leadership without leading to adverse changes in our competitive position;
- Climate Change initiatives in Canada should recognize the global marketplace and the ability of companies to shift operations to lower cost countries and purchases to lower cost sources, and to shift capital to investments with better returns (including those not included in Kyoto agreement);
- Canadian policies should not constrain the growth of environmentally responsible/ advanced Canadian firms (i.e. best in class) resulting in the transfer of growth to less environmentally responsible countries or locations - having a negative impact on the global environment; and
- Policies addressing Climate Change should be supported when:
  - productivity and marketability improvements outweigh costs;
  - there is an even playing field in terms of costs to Canadian industry and our international competitors.

Climate Change initiatives must aim for sustainable actions which also can lead to the achievement of other environmental/health and economic objectives

The chances of sustained action towards Climate Change would improve if initiatives taken by government, industry and Canadians achieve many objectives. To the extent possible stakeholders should work towards policies which have multiplier benefits in terms of environmental or health issues, transportation problems in cities, competitiveness issues and other areas.

Governments and industry should avoid actions which focus on short term and high cost actions (i.e. 5-10 years) and that do not lead to sustainable changes over the long term.

While recognizing that some immediate initiatives can be productive, it will not be possible to decrease emissions by 25% without considerable impact on all Canadians. Thus, industry should ensure that:

- Policies are favoured that result in actions which will have a fundamental and sustainable impact on the use of energy over the long term (20-30 years);
- Policies or initiatives seek to reduce emissions throughout the life cycle of products as opposed to simply focussing on emissions at the point of production; and
- Policies or initiatives by government, companies or other groups recognize that Climate Change is only one issue among many issues. Given the resource limitations of government, the economy and society, it is important to ensure that Climate Change initiatives do not displace other priorities.

APPENDIX D – BARRIERS TO CO-GENERATION

Co-generation has been identified as having significant Greenhouse Gas (GHG) reduction potential in Canada. However, adoption and implementation of co-generation opportunities has significantly lagged behind the potential due to a number of barriers. Some of these barriers are a legacy of a past in which centralized monopoly generation and transmission of electricity was seen to best service the public need. Society has now deemed that a shift to a more competitive electric marketplace would be beneficial. It is incumbent on society to participate in removing the barriers that stand in the way of optimizing energy management, including both large and small-scale co-generation

BARRIERS TO CO-GENERATION

Grid Access – Most of Canada's provinces do not have clear guidelines for access to the grid. Instead, co-generation project sponsors must negotiate grid access, standby power, and other services with the Crown Power Company who normally has no incentive to make it easy or economic. As a result, co-generation projects often take many months or even years to develop – if at all.

GHG Assessment - Under current Voluntary Challenge Registry (VCR) practices, electrical system users are assessed an 18 % GHG impact factor on their gross electrical consumption. This is added to each user's total GHG emissions in tonnes of CO2 equivalent. Users that implement co-generation for part of their load are still assessed GHG emissions on their gross electrical load including any self generated electricity. Self generators are effectively double penalized on their co-generation because they are assessed for the CO2 equivalent on the self generated electricity as well as for the fuel burned in the co-generation process.

Proposed Ontario Net vs Gross Billing On Transmission Tariffs. - Industry currently expects that transmission tariffs in Ontario will be fixed for 18 months starting in Nov 2000. After this, rates will be adjusted to reflect grid capacity. Users in "congested areas", areas where the grid is weak with respect to load, would have higher transmission & distribution tariffs. The provincially owned transmission company has also proposed that transmission tariffs be implemented on a partial gross load basis. This would require that customers with new embedded co-generation would pay transmission charges based on their net load plus 50% of the output of their co-generation. This proposal is subject to approval and is currently in hearings before the Ontario Energy Board. As proposed, this gross load billing would discriminate against efficient co-generation projects by forcing customers to pay for transmission services they may not use.

Standby Power - Unless a self generator can afford business interruption caused by the potential for downtime of their co-generation facility, some form of standby power is required for "back up" purposes. Installation of redundant generation capacity requires high capital investment. Consequently, most customers with embedded co-generation prefer to choose a grid connection for "back up" and to receive ancillary services provided through the transmission grid. Regardless of how it is implemented, standby power is also, by it's very nature, costly since it is only required during emergency situations. Companies must invest capital to install standby capacity with only limited and unreliable sales volumes to cover this investment. The resulting cost and rate structures for such standby power could seriously harm the economics of an otherwise successful project.

Immature Electrical Market – Many users are reluctant to jump into co-generation because retail and wholesale competition is still in its infancy phase, and they can not predict what open access pricing and availability will be. Co-generation requires investment of $1.0 to 1.5 million per MW. It is difficult to make this investment when there is a possibility that open access may make power available on the market that is priced such that investment in co-generation would not be attractive.

Gas Market Volatility - Canada is currently experiencing a volatile gas market with pricing trending upwards. This is due in part to additional pipeline capacity coming on line that permits increased delivery of western Canadian gas to the US west coast, mid west and east coasts. Alberta gas costs will tend to reflect higher "North American pricing". Pricing on Alberta gas delivered in Ontario will have to compete with gas delivered to the new markets that the additional pipeline capacity is opening up. The uncertainty in gas costs adds to the risks associated with co-generation. Beyond this, there is also fear that the NEB regulator will allow TCPL to increase rates to compensate for the lost volume to the Alliance pipeline.

Technical Concerns - Co-generation has been around for decades yet it is still a technology that because of its limited usage is not common knowledge. In our previous regulated market it's use was largely discouraged. With an open market system and greater use of this technology this barrier should be reduced.

"Environmental" Electrical Rates - Currently all rates for electricity whether generated through coal, oil, gas, nuclear or hydro, are the same. This does not encourage use of cleaner forms of energy such as gas fired co-generation.

POTENTIAL POLICY CHANGES

There are a number of policy changes that could address the identified barriers in order to realize the greenhouse gas reductions that would result from increased co-generation in Canada:

Grid Access - All provinces need policies that clearly define access to the grid as well as to standby power, and other services in order to encourage the development of viable economic co-generation projects. Since surplus power is almost a certainty for co-generation projects operating at optimum efficiency and full steam utilization, reasonable well-defined grid access will also help promote maximum efficiency and economy and the environmental advantages thereof.

GHG Assessment - The GHG Assessment should be changed in the VCR formula so that users are only assessed GHG impact for their net electrical purchase. Encouraging increased implementation of co-generation will reduce net CO2 production because utility run generation, which is more dependant on oil and coal in the majority of provinces, will be reduced and replaced with less CO2 intensive co-generation.

Transmission Tariffs - Transmission Tariffs should reflect net rather than gross electrical usage. Removing this barrier to co-generation in Ontario and discouraging similar tariffs elsewhere in Canada will encourage co-generation development, especially in congested areas. This would also alleviate grid weaknesses in those areas.

Standby Power – Tax concessions to reduce the cost of standby power could be considered. There are also benefits that could be derived from policy that provides a means to provide standby power to a pool of co-generation users. This would reduce the total capacity that would have to be built since not all users would require standby power at any given time, and overall rates could be less.

Immature Electrical Market - Until there is a fully developed market-driven framework in place, it will be almost impossible for co-generation project sponsors to assess the competitive viability of co-generation projects. Therefore, policy needs to push for a real open market-driven system.

Environmental Pricing - In the discussions that are taking place on various carbon tax regimes, "Environmental" Electrical Rates may be established that reduce rates for environmentally friendly forms of generation. From an environmental standpoint gas fired co-generation would certainly rate above most other forms of fossil generation, but below hydroelectric and nuclear generation. A favourable environmental price should encourage users through the required incentive to "buy green".