CLIMATE OF CHANGE

Fuelling the Climate Crisis

THE CONTINENTAL ENERGY PLAN

David Suzuki Foundation

Finding solutions

May 2001

The Author

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David Suzuki Foundation
2211 West 4th Ave., Suite 219
Vancouver, BC, Canada V6K 4S2
Tel: (604) 732-4228
Fax: (604) 732-0752
email: solutions@davidsuzuki.org
www.davidsuzuki.org

Fuelling the Climate Crisis

Carbon-based fuels such as coal, natural gas and oil products, like gasoline, play a major role in our economy and in our lives.

Whether for heating our homes, powering our transportation systems or fuelling our industries, they appear to be vital. Unfortunately, these fuels are significant contributors to local air pollution and the biggest contributor to global climate change, regarded by many experts as today's greatest environmental threat. While the scientific understanding of global warming is strengthening day by day, in Canada the political will to address its causes is now clearly subordinate to the expansion of fossil fuel production and exports.

But this doesn't need to be the case. While Canadians are indeed highly dependent upon the services that energy provides, sources other than fossil fuels – conservation and renewable energy – are just as technically feasible and economically available. They have the important advantages of causing little or no pollution, creating jobs and income throughout the country, and insulating consumers from high energy prices.

In Canada the political will to address global warming is now clearly subordinate to the expansion of fossil fuel production and exports.

While world markets for renewable technologies and energy efficiency are expanding rapidly, Canada's energy future is being developed by the fossil fuel industry in collaboration with US political leaders, energy regulators, and policy makers. Through this process, an expansionist energy policy eliminates an effective climate protection policy. For its part, the Canadian government encourages and rewards the development of fossil fuel supply and production. This follows many

years of historic subsidies and incentive programs for exploration and development in tandem with the deregulation of the oil and natural gas markets.

Between 1970 and 1999, the federal government gave $40.4 billion in loans and grants to the oil and gas industry.[1] Simultaneously, since the mid-1980s, significant federal involvement in energy efficiency and renewable energy has declined to a point where our government now merely plays one of two roles: as a major energy consumer or as a distributor of consumer information. With its fossil-fuel component primed with abundant taxpayers' funds, the continental energy market now drives decisions, not Canadian public policy.

Although this lack of government involvement in energy efficiency has enriched oil and gas companies and some Canadian provinces, consumers are now facing increasingly high prices for energy, with little or no direct assistance aimed at reducing their individual energy needs. Significant developments in the US have increased the potential to make this energy crisis worse. US demand for energy is growing and the new Bush administration has made it clear that there is no significant role for energy conservation or renewable energy and that, instead, Canadian oil and gas resources will play an ever-expanding role in meeting that US demand. In March, 2001 President Bush stated: "We've got to make sure that gas comes – flows freely out of Canada into the United States."[2]

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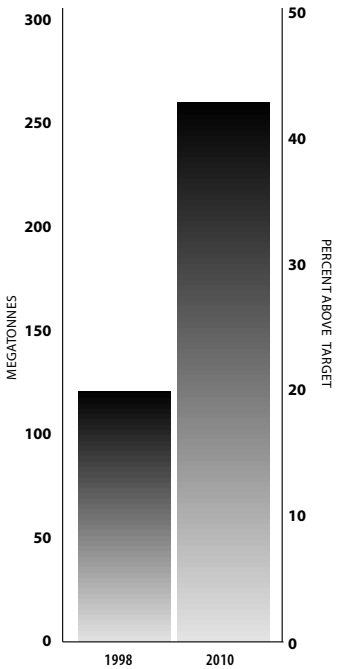
In the absence of conservation policies, the US electricity market is projected to grow by 45 per cent over the next 20 years which will drive the need for over 1,300 power plants, many of which will be burning Canadian natural gas.[3] Canadians will face more and more demand and competition for their energy resources from the US and will continue to pay international and continental market-based prices for that energy. While this may send an appropriate price signal to consumers concerning the need for energy efficiency, without real programs aimed at managing demand, this policy will force individuals, households and businesses in many parts of Canada to bear an unwelcome financial burden.

At the same time as this massive demand for Canadian fossil fuels is occurring, international pressure is growing for an effective treaty aimed at slowing global warming. For our part, Canada has signed, but not ratified the Kyoto Protocol and ratified the United Nations Framework Convention on Climate Change, both of which are broad international commitments to stabilize and reduce greenhouse gas emissions. However, despite these agreements, Canada's annual emissions are approximately 20 per cent above the Kyoto target, which requires reductions to six per cent below 1990 levels between 2008-2012.

Fuelling the Climate Crisis demonstrates that, under current market trends, the planned growth in Canadian fossil fuel production and use will see our emissions rise to 44 per cent above the Kyoto target by 2010. Recently announced tar sands expansion projects, new natural gas production to meet US demand projections, and new coal-fired electricity generation will add 63.5 megatonnes of greenhouse gas emissions to Canada's projected annual total, which is

MISSING THE TARGET: GREENHOUSE GAS EMISSIONS GROWTH ABOVE THE KYOTO TARGET



CONTINENTAL ENERGY PLAN MEANS CANADA WILL MISS THE KYOTO TARGET BY 44 PER CENT

CANADA'S EMISSION GROWTH

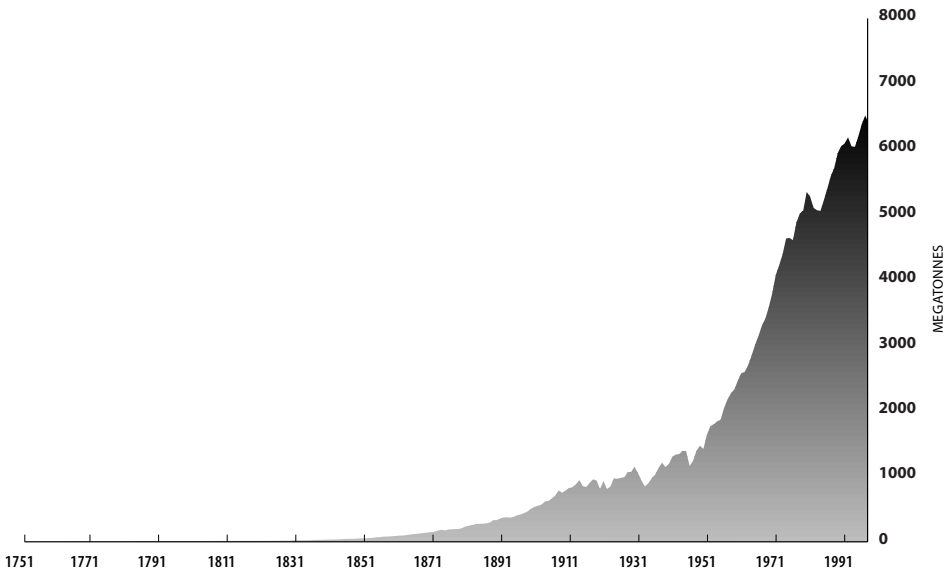
one-quarter of the projected 44 per cent growth. Continuing on Canada's current energy path will, therefore, force future generations to tackle an even larger greenhouse gas problem. As Canadians witness the role of government and industry decision makers in the growth of a larger and larger 'Kyoto gap', we must also remember that scientific analysis is calling for greenhouse gas emissions to be reduced by 60-80 per cent in order to move towards climate stability.[4]

Fuelling the Climate Crisis demonstrates that, under current market trends, the planned growth in Canadian fossil fuel production and use will see our emissions rise to 44 per cent above the Kyoto target by 2010.

The Science of Global Climate Change

In the early 19th century Jean-Baptiste Fourier, a French mathematician, first conceived of an atmospheric greenhouse effect by which trace atmospheric gases, such as carbon dioxide, retain some of the sun's heat in the lower atmosphere. He theorized that without these gases, the earth's temperature would not support the variety of life found on this planet.[5] In the mid 19th century Svante Arrhenius, a Swedish physicist, determined that, over time, coal consumption would cause concentrations of carbon dioxide to double, leading to an average temperature increase of five to six degrees Celsius.[6]

In the mid 1950's when scientists first began measuring the carbon dioxide content in the atmosphere, they found that, on average, carbon dioxide concentrations varied between 315 and 318 parts per million across the globe.[7] To get a better understanding of the relevance of these findings in relation to historic patterns of carbon dioxide concentration, scientists also started analyzing ice cores taken from long-lived glaciers. Since glaciers are formed by annual deposits of snow, which turn into ice, each year's accumulation has a distinct carbon



HISTORIC EMISSIONS OF CARBON INTO THE ATMOSPHERE, 1751–1997

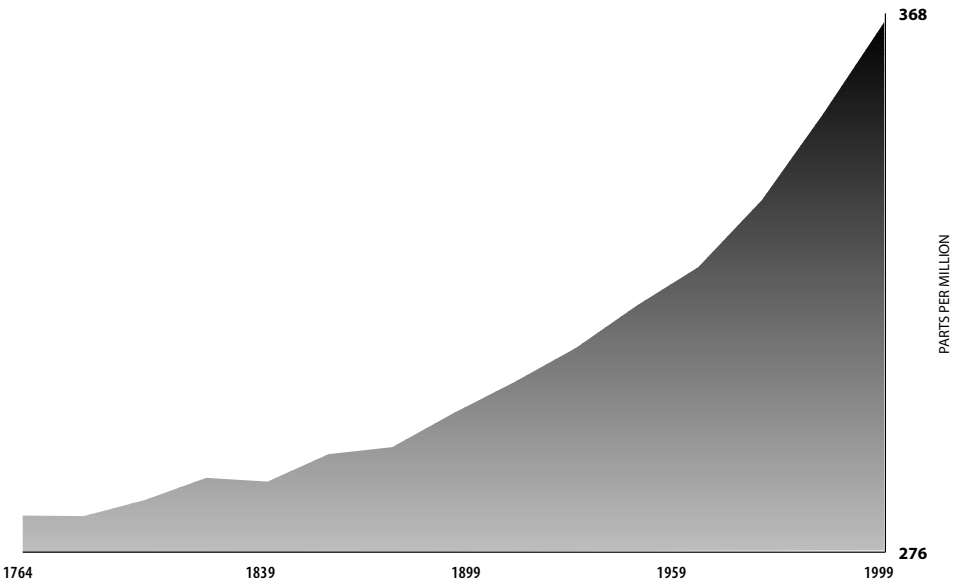
SOURCE: Carbon Dioxide Information and Analysis Centre

We must also remember that scientific analysis is calling for greenhouse gas emissions to be reduced by 60-80 per cent in order to move towards climate stability.

dioxide content contained in air bubbles trapped with the snow. By examining these bubbles, a record of the earth's atmospheric carbon dioxide concentration can be determined. The longest ice core examined to date contains a 420,000 year record from the Vostok glacier in Antarctica. Other ice cores have been examined from glaciers around the globe yielding similar results.

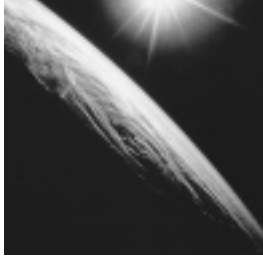
The data revealed that, prior to the Industrial Revolution, carbon dioxide concentrations varied slightly around a mean level of 280 parts per million for several thousand years. Due to the combustion of massive quantities of fossil fuels and the widespread destruction of forests, concentrations have increased to 368 parts per million. Today carbon dioxide concentrations are 23 per cent higher than at any time over the past 420,000 years.[8]

Following current trends, atmospheric concentrations are expected to be two times pre-industrial levels sometime between 2030 and 2050. As a result, scientists predict that, on average, annual global temperatures will increase by between 1.1 and 3.1 degrees Celsius in that period. Some areas, such as the Canadian Arctic, can expect to see much more drastic increases in the order of 10-12 degrees.[9]



ATMOSPHERIC CARBON DIOXIDE CONCENTRATIONS

SOURCE: Carbon Dioxide Information and Analysis Centre



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The impacts of climate change

For every one degree increase in temperature there is expected to be an overall increase in precipitation of five per cent, leading to changes in the intensity and magnitude of rain and snowfall. Other expected effects include changes in soil moisture content, increases in sea level and increased prospects for extreme weather events, floods and droughts.[10] Some of these effects are already occurring. In Canada, one indicator of the direct ecological impacts of climate change is the polar bear. Research by the Canadian Wildlife Service illustrates how the reduction and thinning of Arctic ice has reduced the feeding opportunities of polar bears, causing their body weight to drop approximately 15 per cent, and reducing the reproduction level.[11]

The world-wide insurance industry has already noticed an increase in natural disasters over the past half century. Weather related natural disasters have increased four fold since 1950 with the costs increasing 14 fold. By 1998, the economic costs arising from weather-related natural disasters surpassed $90 billion US. In Canada, between 1984 and 1998, economic losses from extreme weather rose by over 30 times, increasing from $39 million to $1.45 billion.[12]

Ironically, climate changes in the north will severely impact fossil fuel exploration and production infrastructure. Currently, drilling for oil and gas can only take place between fall freeze and spring thaw. As the muskeg begins to freeze later and melt earlier, drilling activities have to be started later and curtailed earlier. Some of these problems are already occurring. According to the *National Post*, drilling at one site, a $25 million well 125 kilometres north of Inuvik, had to be halted in March before the ice road to the site melted and the rig sunk.[13] Similar problems have also been encountered on Alaskan petroleum development sites.[14] As the climate warms and permafrost melting accelerates, pipelines, airstrips, community water supplies and building foundations will all become susceptible to damage due to ground subsidence, a trend already underway in the Arctic. [15] US Senator Ted Stevens, a Republican from Alaska, recently made this point during a Senate Commerce Committee meeting on climate change: "We face the

problem of moving native villages that have been located along the Arctic and West coast of Alaska for centuries because they are surely being inundated by seawater. This is a creeping disaster."[16]

"We face the problem of moving native villages that have been located along the Arctic and West coast of Alaska for centuries. This is a creeping disaster."

US SENATOR TED STEVENS (ALASKA)

In response to growing concerns regarding the increase in carbon dioxide levels, the World Meteorological Organization and the United Nations Environment Program established the Intergovernmental Panel on Climate Change (IPCC) in 1988. The purpose of the IPCC is to assess the scientific information related to various aspects of climate change and formulate realistic response strategies. In 1990, the IPCC concluded that, in order to stabilize carbon dioxide concentrations at 1990 levels, immediate emission reductions of 60 per cent would be necessary.[17] In 1996 the IPCC released the Second Assessment Report on climate change which predicted that, by 2100, average surface temperature could increase by between one and 3.5 degrees Celsius.[18] The most recent report of the IPCC indicates that global temperatures could rise by as much as 5.8 degrees over the 21st century and that: "there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities."[19]

International Policy on Global Climate Change

Following the first IPCC report, the United Nations Framework Convention on Climate Change (UNFCCC) was developed as an international treaty aimed at preventing climate change. The UNFCCC was negotiated in 1992 just prior to the United Nations Conference on Environment and Development, held in Rio de Janeiro. The treaty took effect on March 21, 1994, after the 50th country ratified it. Canada ratified on December 4, 1992. By September, 2000 it had been ratified by a total of 186 countries.

The objective of the UNFCCC is the stabilization of "greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic [human-induced] interference with the climate system." Further to the Convention there have been six Conferences of the Parties, including the Kyoto meeting held in December 1997, which resulted in a Protocol to the Convention, now known as the Kyoto Protocol. In November 2000, the sixth Conference of the Parties, which was to determine how specific emission reduction mechanisms described in the Kyoto Protocol would operate, was held in The Hague, Netherlands. There was no conclusive result from the sixth meeting and negotiators are to resume meeting in July, 2001 in Bonn.

The Kyoto Protocol called on industrialized nations to reduce their collective emissions of greenhouse gases by 5.2 per cent below 1990 levels by 2008 – 2012. Canada agreed to reduce greenhouse gas emissions to six per cent below 1990 levels by that period. On a per capita basis, Canada is one of the largest producers and consumers of fossil fuels and therefore one of the largest emitters of greenhouse gases in the world.

In 1990, Canada's per capita emissions of all greenhouse gases were equivalent to 21.5 tonnes of carbon dioxide per person, but by 1997, this had grown to 22.7 tonnes. Canada's per capita emissions of carbon dioxide alone equalled nearly 18 tonnes. The global average is 3.8 tonnes and the continent of Africa had per capita emissions of 1.1 tonnes.[20] Clearly, responsibility for greenhouse gas reduction lies primarily with the economically developed nations because collectively they are the world's largest emitters and they have the technical and financial ability to change.

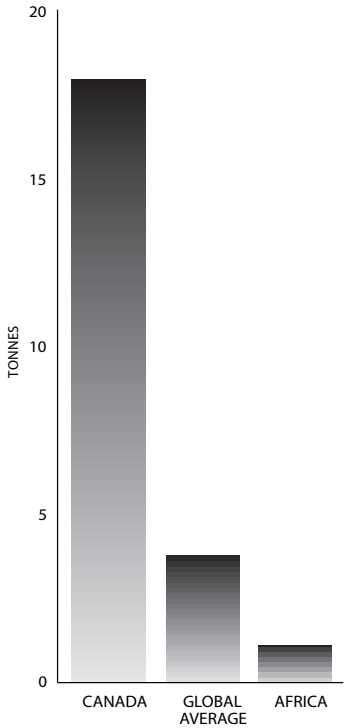
CANADA: A MAJOR ENERGY PRODUCER AND A MAJOR POLLUTION SOURCE

Canada is the fifth largest energy producer in the world and among the top producers of petroleum and natural gas. We are the single largest foreign source of energy for the world's largest energy consumer, the United States, and are also one of the biggest users of energy in our own right. In terms of total energy use, we consume the same amount of energy as India, a country with over one billion people.[21]

A major source of our greenhouse gas emissions is the production and delivery of fossil fuels, both for the domestic market and for export to the United States. According to one study, on average the production and transmission of each 1000 cubic metres of natural gas results in the emission of 351 kilograms of greenhouse gases measured as carbon dioxide equivalents, while using the natural gas itself adds 1,904 kilograms.

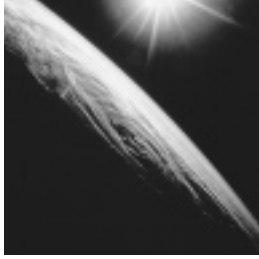
As a result, the greenhouse gas emissions associated with processing and moving natural gas from Alberta to Chicago are equal to 18 per cent of the emissions caused by using the gas. Similarly, the combustion of 1,000 litres of gasoline results in 2,604 kilograms of carbon dioxide emissions. However, if the gasoline is derived from tar sands oil, there is a further 1,004 kilograms of carbon dioxide released during production and refining of the oil.[22]

In 1990, Canadian oil and gas production released 80 megatonnes of greenhouse gas emissions out of a national total of 612 megatonnes. By 1998, this had grown to 98 megatonnes out of the growing national total of 692 megatonnes. Due to the rapid growth of natural gas production and petroleum processing for the US export market, fossil fuel *production* was responsible for fully one quarter of Canada's growth in energy-related emissions over this eight year period.[23] Current world energy prices, combined with federal and provincial government enthusiasm for continued rapid growth and an ever-growing market demand for fossil fuels, will virtually guarantee that this sector's cumulative environmental impact worsens.



PER CAPITA CARBON DIOXIDE EMISSIONS

SOURCE: Energy Information Administration US DOE



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Recent trends in Canada's fossil fuel production

Natural gas: growing use drives expanded development and higher emissions

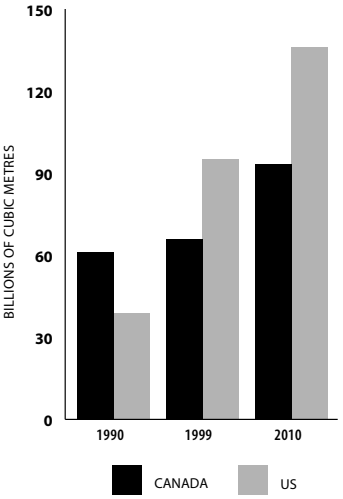
Natural gas is a fossil fuel which was formed from the breakdown of prehistoric plant matter buried deep beneath the earth's surface. It is usually found in porous rock formations in and around crude oil deposits. Sometimes the gas contains hydrogen sulphide and is known as sour gas. It can also contain varying quantities of carbon dioxide and some petroleum liquids. In order to market the gas, industrial processing plants remove the impurities, such as sulphur and carbon dioxide, and extract the petroleum liquids, which are sold as separate products. These processing plants use significant quantities of natural gas and coal-fired electricity as energy sources which is one reason why an expanding export market for natural gas is leading to increased Canadian greenhouse gas emissions, even though the ultimate product is burned outside of Canada. Drilling is also energy-intensive, and Canadian gas wells are being drilling at a record rate.

In 1999, 177 billion cubic metres of Canadian natural gas were supplied to the market. Canadians used 66 billion cubic metres, while 10 billion were put into storage and 6.4 billion was used as pipeline fuel. The remainder, over 95 billion cubic metres, was exported to the United States. As noted, the production and processing of fossil fuels is one of the fastest growing sources of greenhouse gases in the Canada. Between 1990 and 1998 this sector's emissions grew by 22 per cent.[24]

Over the same period natural gas exports to the United States more than doubled, increasing from 38.8 billion cubic metres to 95 billion. In 2000 two new pipelines began delivering Canadian gas to the US. These are the Alliance Pipeline which begins in Fort St. John, British Columbia and delivers gas to Chicago, and the Sable Island Offshore Project and pipeline which moves gas from the continental shelf off Nova Scotia to markets in the North Eastern US. Preliminary estimates by the US Energy Information Administration suggest that exports from Canada to the US were at least 98.9 billion cubic metres in 2000.[25]

In addition, current proposals to access gas in the Northwest Territories will add another eight billion cubic metres to this production, with gas beginning to flow by 2006.[26] Natural gas reserves off the coast of Newfoundland and Labrador may also be linked to the North American pipeline network over the next 10 years. In Canada, domestic natural gas usage is expected to increase from 82 billion cubic metres in 1999 to 93.2 billion by 2010. [27]

Domestic use of natural gas increased 8 per cent since 1990, from about 61 to 66 billion cubic metres in 1999.[28] This increase does not include the use of natural gas to power pipelines, many of which supply the export market, which grew 154 per cent in that period. Largely as a result of this trend in US demand, greenhouse gas emissions from Canadian oil and gas production are expected to continue increasing dramatically.



CANADIAN NATURAL GAS MARKETS

SOURCE: Stats Can and US EIA.

The projected growth in US demand for Canada's natural gas

US natural gas consumption and imports, almost exclusively from Canada, are expected to expand substantially through 2010, with the fastest growth resulting from additional gas-fired electric power plants.[29] Annual US demand for natural gas is expected to grow from 603 billion cubic metres to 794 billion between 1999 and 2010, a 32 per cent increase.

It is important to note that, at the same time, US coal consumption is expected to increase from 923 million tons to 1,122 million tons, a 21.5 per cent increase. *The often repeated notion that 'clean' natural gas will replace 'dirty' coal for electricity generation is not supported by this analysis.* Canada's Environment Minister, David Anderson, has frequently supported increased natural gas development on the strength of the argument that "it replaces coal."[30]

In fact, this "replacement" process did not occur in the United States during the 1990s when Canadian natural gas exports rose substantially. For example, between 1990 and 1999, CO_2 emissions from US coal-fired power plants rose 18 per cent.[31] Following that same pattern, US agencies project that both coal and natural gas supplies will grow to meet new electricity demand and replace some ageing nuclear power plants as they are decommissioned.

Largely as a result of this trend in US demand growth, greenhouse gas emissions from Canadian oil and gas production are expected to continue increasing dramatically.

Canada's oil: a growing export commodity for US markets

Crude oil occurs in a variety of forms and consistencies in several regions of Canada. The types of oil range from light crude which can be easily shipped and then processed at a refinery, to heavy oil which must be processed and upgraded before it can be refined, to tar sands. The latter are nearly solid and require extensive processing to extract bitumen, a very heavy oil that in turn requires

Exports to the US have grown from 234 million barrels in 1990 to over 458 million barrels by 1999, a 95 per cent increase.

further processing before it can be used as an energy source. Each stage of processing and upgrading requires the use of significant quantities of energy, which is, in most cases, derived from burning fossil fuels. As in the natural gas industry, the oil industry uses significant quantities of fossil fuel and electricity to produce a marketable product, thereby increasing Canada's greenhouse gas emissions even though much of the end product is exported to the US.

Canadian oil production has increased from 547 million barrels in 1990 to 698 million barrels in 1999. In the latter year, Canada imported 299 million barrels to supply eastern provinces.[32] Exports to the US have grown from 234 million barrels in 1990 to over 458 million barrels by 1999, a 95 per cent increase. From January to November 2000, the US imported more crude oil and petroleum products from Canada than from any other country.[33]

Following recent meetings with Prime Minister Chretien on the proposed continental energy policy, US President George W. Bush stated that: "Canada is going to be the largest exporter of crude oil to the United States."[34] For its part, the federal government has responded very enthusiastically to the opportunity to substantially expand oil exports but has denied there are implications for greenhouse gas emission increases.

The growing US demand for petroleum products

In the US, demand for petroleum products is growing steadily, particularly for transportation fuel. In 2000, the US used 19.6 million barrels of oil per day, with 13.1 million being used for transportation, of which highway vehicles used 80 per cent. Increasingly this demand is being met with imported petroleum. For example, in 1998, the transportation sector used the equivalent of all US oil production, plus 40 per cent of all imports.

US transportation fuel use is expected to grow by 22 per cent and reach 16 million barrels per day by 2010. One of the key causes of recent and projected growth is the trend towards heavier, less fuel efficient vehicles such as Sport Utility Vehicles, minivans and trucks, which are all regulated as "light duty trucks" (LDTs), rather than as "passenger vehicles", which must meet higher fuel efficiency standards. In 1988, Americans bought 10.3 million cars and 4.74 million LDTs. But by 2000, Americans had shifted their purchasing dramatically towards the heavier vehicles, purchasing only 8.6 million cars and 7.4 million LDTs.[35] Since these vehicles travel an average of two kilometres less per litre of gasoline than cars, this trend is also causing increased fuel consumption and greenhouse gas emissions.

In 1990, cars used 262 billion litres of gasoline while LDTs used 120 billion. By 1999 passenger car fuel use had grown by 11 per cent to 291 billion litres, while light truck usage increased by 29 per cent to 154 billion litres.[36] Clearly the shift towards SUV's, minivans and trucks is having a direct impact on

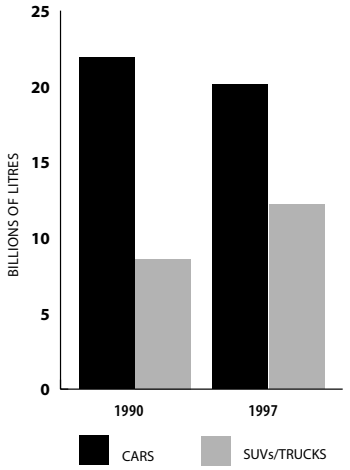
US petroleum demand, and since Canada is a major producer of US-consumed petroleum, this is having a direct impact on Canada's greenhouse gas emissions. A good portion of the remaining growth in US fuel consumption can be attributed to the increasing use of diesel trucks for heavy freight movement. In 1990, heavy duty diesel trucks used 60 billion litres of diesel and by 1999 this had grown by nearly 42 per cent to 85 billion litres as "just in time" inventory control and delivery made truck freight increasingly preferable to more energy-efficient rail freight.[37]

While the US export market is the main reason for expansion in our oil and gas industry, Canadians are also increasing our use of fossil fuels and our greenhouse gas emissions, partly as a result of the same trends towards heavier personal vehicles and towards more freight movement on heavy duty trucks instead of by rail. Between 1990 and 1997, the number of cars on the highway dropped from 11.1 million to 10.6 million, while the number of light duty trucks increased from 3.45 million to 4.85 million.

The average car in Canada uses five litres of gasoline per day while light duty trucks use seven litres, a difference of 40 per cent. In 1990, cars used 21.9 billion litres of gasoline, while LDTs used 8.6 billion. By 1997, car fuel use had fallen to 20.1 billion litres while fuel use by light duty trucks had risen to 12.2 billion litres.[38] In total, Canada used 98 billion litres of petroleum in 1990. This figure grew to 106.8 billion by 1997.[39] Over half of this growth was directly related to the shift in vehicle choice away from cars and towards light duty trucks.[40]

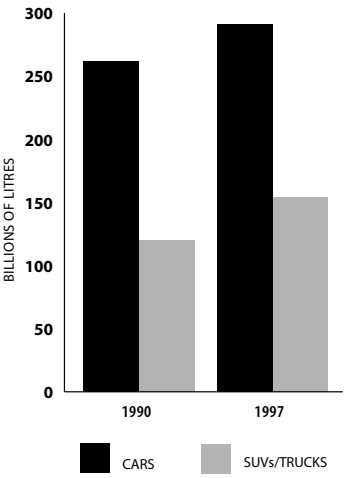
In Canada, there are no mandatory vehicle fuel efficiency standards. Although legislation for that purpose was passed in 1981 by the House of Commons and the Senate, it has never been proclaimed into law. Instead, Canada's auto industry has been allowed by Ottawa to voluntarily use the long-outdated US standards, which in 1981, included the preferential treatment of "light duty trucks." Improvements to the US standards have been blocked by the auto manufacturers, other special interest lobbies, and their political allies. It is worth noting that in October, 2000 Environment Minister David Anderson committed to negotiating new efficiency standards with the auto manufacturers, but to date there is no indication that such negotiations have been undertaken.

Just as the Canadian trend toward heavier personal vehicles mirrors the US trend, a switch from trains to trucks for freight movement is similarly responsible for much of the remaining growth in fuel use. Fuel used by heavy duty diesel trucks increased from nine billion to 13 billion litres over the same period, accounting for most of the remaining increase in demand. Gasoline use is projected to increase to 43 billion litres by 2010, while diesel for road use is projected to be 14 billion litres, assumptions that do not anticipate significant alterations to the transportation trends that are at the base of the increases in Canada and the US.[41]



CANADIAN GASOLINE USE

SOURCE: Environment Canada



US GASOLINE USE

SOURCE: US EPA

Canada's energy supply: much more than the climate can handle

The National Energy Board estimates that, potentially, there are 57.8 billion barrels of conventional crude oil yet to be exploited in Canada. Unconventional supply, including tar sands, is estimated to yield a further 308 billion barrels of crude oil. This is enough oil to meet world demand for about 14 years. However, using all of this Canadian oil – a small fraction of global reserves – would add approximately 177 billion tonnes of carbon dioxide to the atmosphere and would, on its own, increase global concentrations of greenhouse gases by an additional 6.7 per cent above 1990 levels.[42]

Potential natural gas reserves are estimated at over 20 trillion cubic metres, out of which 11.6 trillion are estimated for the Western Sedimentary Basin, which includes the large deposits in Alberta, BC and Saskatchewan. A further 8.5 trillion are expected to be discovered in frontier areas including the Grand Banks, the Mackenzie/Beaufort Sea area, Arctic Islands and other areas of the NWT and Yukon.[43] This would yield approximately 772 billion gigajoules of natural gas. The use of this gas would add about 38 billion tonnes of carbon dioxide to the atmosphere, increasing the atmospheric concentration over the entire globe by a further 1.5 per cent above 1990 levels.[44]

Using all of this Canadian oil – a small fraction of global reserves – would add approximately 177 billion tonnes of carbon dioxide to the atmosphere and would, on its own, increase global concentrations of greenhouse gases by an additional 6.7 per cent above 1990 levels.

While Canada as consumer of fossil fuels is adding approximately 2.7 hundredths of a per cent per year to the atmospheric concentration of carbon dioxide, as a producer of fossil fuels we have the potential to add 300 times that amount by supplying this fuel to the international market. Increases of this scale have set off warning signals within the climate science community. For instance, the chair of the IPCC's working group on mitigation and adaptation, Dr. Bert Metz, commented recently that the atmosphere will be overloaded with greenhouse gases long before fossil fuel reserves are consumed. "You [can] get really into the areas of very significant and high risks, and you haven't even burned one-quarter of the carbon in the ground."[45]

For the last 12 months prices for crude oil have been at their highest level in the last 20 years, while natural gas prices are at unprecedented levels. In 2000, the average wellhead price for natural gas was $5.10 per gigajoule.[46] Oil averaged over $40 per barrel for light crude. As a result there has been a dramatic increase in the number of oil and gas exploration and development projects in Canada. These projects are being planned and implemented at the same time as Canada is claiming to respect the Kyoto Protocol which requires our annual greenhouse gas emissions to average 575 megatonnes between 2008 and 2012, six per cent below the 1990 levels of 612 megatonnes.

Canada's most recent inventory, 1998, shows that our emissions are at 692 megatonnes, well above the Kyoto target and officially projected to climb to 764 megatonnes by 2010, 25 per cent above 1990 levels. If sustained, the current

oil and gas expansion strategy of the petroleum industry and the federal government will make it nearly impossible to achieve the target, despite statements to the contrary by Prime Minister Chretien and cabinet ministers. This strategy is in obvious contradiction to the international commitments made by Canada through the Framework Convention and through the Kyoto Protocol, and will drive our greenhouse gas emissions to a level 44 per cent above Canada's Kyoto target.

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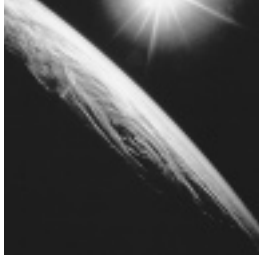

3

New petroleum production: meeting the new demand

Significant new oil and gas activity is occurring on the Atlantic continental shelf, in the west and in northern Canada, primarily in response to the growing demands for fossil fuel in the US.

Alberta tar sands expansion

Photo © Todd Korol

Alberta's tar sands are made up of a mixture of sand, clay, water and bitumen, a thick tar-like oil. The tar sands cover approximately 77,000 square kilometres spread throughout northern Alberta. Approximately two tonnes of tar sands have to be processed to yield one barrel of bitumen. It is estimated that current technologies and processes can recover over 300 billion barrels from this area. [47] Today's oil production from tar sands results in the production of bitumen for processing into a light synthetic crude oil on site, or for shipment to centralized upgrading facilities in Western Canada or in the Northern and Mid-Western US. Upgrading involves the addition of hydrogen and the removal of some carbon, and is responsible for 60 per cent of the costs, emissions and energy use involved in the production of synthetic crude oil from bitumen.[48]

In order to ship bitumen to processors, it must first be thinned by about 30 per cent using another petroleum product so that it can be shipped in a pipeline. In 1999, 118 million barrels of synthetic crude oil were produced as well as 89 million barrels of bitumen.[49] Current proposals and projects are expected to result in the combined production of an additional two million barrels per day of synthetic crude and bitumen by 2010, a doubling of total Canadian oil production in 1999.

There are three main processes for removing bitumen from tar sands. One involves mining the sand and transporting it via truck, conveyor or pipeline to a processing plant where the bitumen is removed using mixing and cleaning processes involving water, caustic soda and some form of agitation. Following the cleaning, bitumen is diluted with naphthalene and sent to an upgrader.

The second main process, which is used to remove bitumen that is too deep to mine, utilizes thermal energy to force the bitumen to flow so that is can then be pumped to the surface for further treatment. While a variety of techniques have been employed to make the underground bitumen flow, the most prevalent technologies in use, or proposed, use steam to transfer heat into the reservoir, then recover the heated bitumen either from the original well or from a second well that is drilled in parallel. The cost of producing steam accounts for over 50 per cent of the operating costs of thermal production.

CURRENT MAJOR TAR SANDS PROPOSALS

PROJECT DESCRIPTION AND PROPONENT[51]	NEW CAPACITY IN BARRELS PER DAY (BPD)
Syncrude Canada Ltd. Tar sands mine expansion and upgrader expansion	265,000 bpd by 2008
Suncor Energy Inc. New upgrader, expanded mining and new thermal in ground recovery	295,000 bpd by 2008
Shell Canada, Chevron Canada Resources and Western Oil Sands Inc. Tar sands mine, pipeline and upgrader	155,000 bpd by 2002
Mobil Oil Canada Tar sands mine and upgrader Following Exxon/Mobil merger project status is uncertain	160,000 bpd by 2006
Canadian Natural Resources Ltd. Tar sands mine and in ground extraction	300,000 bpd by 2010
TrueNorth Energy/UTS Energy Tars sands mine and extraction plant	190,000 bpd by 2008
SynEnCo Energy Inc. Tar sands mine and extraction plant	50,000 bpd by 2004
Alberta Energy Company In ground steam assisted extraction	100,000 bpd by 2007
Petro-Canada Oil and Gas In ground steam assisted extraction	130,000 bpd by 2010
Gulf Canada Resources Ltd. In ground steam assisted extraction	100,000 bpd by 2010
Imperial Oil Ltd. In ground steam assisted extraction	55,000 bpd by 2010
Pan Canadian Petroleum In ground steam assisted extraction	70,000 bpd by 2009
Various smaller projects using In ground steam assisted extraction	130,000 bpd by 2010
Total new production	**2,000,000 bpd by 2010**

The third technique uses horizontal or vertical wells to remove lighter forms of bitumen which are already capable of flowing.[50]

There are currently over 60 projects proposed or under development in the Alberta tar sands area (*see table, page 15*). These include a variety of bitumen extraction projects, upgraders, tar sands mines and pipelines. The total value of these projects is estimated at $51 billion.

The National Energy Board estimates that approximately 75 kilograms of carbon dioxide equivalents are released per barrel of bitumen produced and approximately 125 kilograms per barrel of synthetic crude oil from tar sands.[52] Some projects are much higher than this. For instance, the Gulf Canada project is expected to have emissions equivalent to 109 kilograms per barrel of bitumen.[53] Opportunities for co-generation of electricity while steam is being produced can help lower the greenhouse gas intensity of production in some situations by replacing some of Alberta's coal-fired power. But due to the large number of proposed projects, electricity transmission constraints will limit the number of projects which can implement these co-generation plants. In total, these proposed tar sands projects will emit about 60 megatonnes.

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Northern oil and gas: key to the "continental energy pact"

The North American Natural Gas Pipeline Group, consisting of Exxon Mobile Corp., BP Plc and Phillips Petroleum is proposing to build a US$10 billion 2,700 kilometre pipeline from Alaska's North Slope to Northern Alberta, along the Alaska Highway. The pipeline would move up to141 million cubic metres of natural gas per day. Depending on the configuration and routing of this pipeline it may be available to take Canadian gas from the Yukon, the southern part of the Northwest Territories, and parts of BC and Alberta. Alaska has estimated reserves of about 877 billion cubic metres of natural gas while the Northwest Territories has 254 billion.

A separate proposal by Imperial Oil, Shell Canada, Gulf Canada and Mobil's Canadian subsidiary, is aimed at building a 2,200 kilometre pipeline from the Mackenzie Valley into Alberta that would move 23 million cubic metres of natural gas per day.[54] Recently, some natural gas has begun flowing out of Fort Liard, NWT and into the Westcoast Energy pipeline and processing system at a contracted rate of up to 5.6 million cubic metres per day. To accommodate growth in gas production in the North and in BC, Westcoast is expanding their pipeline capacity by that amount.[55] This is relatively small in comparison to the total quantity of gas currently moving on the gas pipeline system. Currently, BC pipelines move about 50 million cubic metres of gas per day while Alberta pipelines move about 340 million cubic metres per day, with 60 per cent for export to the US.[56]

According to the petroleum industry, the average greenhouse gas emission ratio for natural gas production and transmission is 367 kilograms of carbon dioxide equivalents per 1,000 cubic metres of natural gas.[57] As a result, new gas development in the North will likely add at least another 3.8 megatonnes of greenhouse gas emissions to Canada's annual inventory.

Expansion plans and projects within the currently active natural gas areas are not included in this analysis. However, demand forecasts from Canada and the United States indicate that total demand for Canadian natural gas will grow to 229 billion cubic metres by 2010. Meeting this projected level of demand would require production of a further 42 billion cubic metres of natural gas, in addition to the new gas already moving from the NWT. Upstream greenhouse gas emissions associated with the production, processing and transmission of this new gas to meet demand growth will add a further 15 megatonnes to Canada's total emissions.

According to the petroleum industry, the average upstream greenhouse gas emission ratio for natural gas production is 367 kilograms of carbon dioxide equivalents per 1,000 cubic metres of natural gas.

Offshore Atlantic deposits

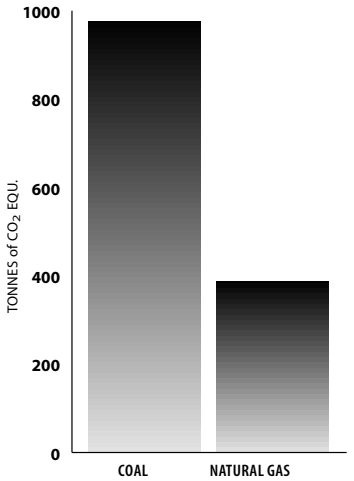
Off the coast of Newfoundland, oil and gas development is in its early stages. This area is estimated to have 2.1 billion barrels of oil and 263 billion cubic metres of natural gas. Currently some gas is being used to power offshore production, some is flared during testing and the majority is re-injected back into the oil field both to conserve the gas for future use and to maintain pressure in the oil reservoir.

Oil production began at the Hibernia site in 1997 and is expected to reach 180,000 barrels per day. Other fields are being developed over the next five years including the Terra Nova project which will reach 125,000 barrels per day by 2002, the White Rose project with a target of 110,000 bpd by 2004 and the Hebron/Ben Novis field which is in the preliminary stages of development. In total, production is expected to reach 500,000 barrels per day.

Each 50,000 barrel per day increase in production is estimated to increase Canada's greenhouse gas emissions by 200,000 tonnes per year.[58] As a result, greenhouse gas emissions will reach over two megatonnes per year when projected production targets are met. In comparison to the tar sands and more mature conventional oil wells, the emissions per barrel of production are much lower. This is because these fields have new, high-volume wells that require less energy to get the oil to the surface and because the producers are re-injecting natural gas rather than flaring it.

Higher electricity demand: more fossil fuel emissions

As previously noted, dramatic increases in the number of natural gas-fired power plants in the US will lead to increased demand for Canadian natural gas. Fossil fuel use for generating electricity is also on the rise in Canada. In provinces such



EMISSION FACTORS PER GIGAWATT HOUR OF ELECTRICITY

SOURCE: BC Ministry of Employment and Investment

as British Columbia, which have traditionally relied on hydro-electricity, and until recently, intensive conservation and efficiency programs, the move to natural gas-fired electricity generation will result in a dramatic increase in greenhouse gas emissions. Under current plans BC will see emissions from electricity generation increase by 5 megatonnes over 1990 levels of 600,000 tonnes by 2015, an 833 per cent increase.

Since demand for Canadian natural gas has increased and is continuing to increase, the price of natural gas in Canada, which is determined by the North American market, will continue to remain high. As a result, in some instances electric utilities in Canada are shelving plans for natural gas-fired plants and developing coal-fired power instead, since coal is so much cheaper than current natural gas prices. In addition, other industries, such as cement manufacturing, are also using coal to power their kilns which, until recently, were often powered by natural gas.

In Alberta, which primarily relies on coal-fired power generation, many analysts had predicted that new electricity generation, under the recently deregulated electricity market, would be from cleaner gas-fired co-generation plants. However, as a result of the high demand for natural gas in the export market, announcements of new Alberta power supply projects have been overwhelmingly for coal-fired power plants. The new coal plants proposed include TransAlta Utilities' 900 megawatt plant at Lake Wabamun, EPCOR's 400 megawatt Genessee expansion and ENMAX Corporation's 400 megawatt plant in the County of Newall.

At a rate of 975 tonnes of carbon dioxide per gigawatt hour, each megawatt of coal-fired power increases greenhouse gas emissions by about 8,500 tonnes annually. In contrast, a combined cycle natural gas plant would emit 386 tonnes of carbon dioxide per gigawatt hour, 60 per cent less than a coal plant. The proposed Alberta coal plants will add approximately 14.5 megatonnes of greenhouse gas emissions annually to Alberta's 1997 emissions inventory of 201 megatonnes.

Since the US demand for Canadian natural gas is expected to continue increasing substantially, this regressive move to coal-fired power is also likely to continue and possibly worsen. Under current market conditions coal-fired power is cheaper than natural gas or even renewable energy, despite the fact that both gas and renewables are obviously cleaner than coal. In part this is because the significant environmental and health costs associated with air pollution are paid by society instead of the utility. Therefore, the electricity market fails to pay the full price for coal-fired power. This subsidy allows coal-fired power production to undercut renewable electrical sources and natural gas-fired electricity production.

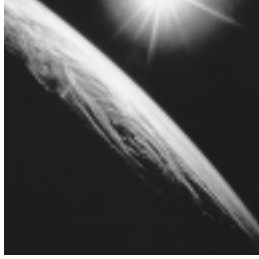
The often repeated notion that 'clean' natural gas will replace 'dirty' coal for electricity generation is not supported by this analysis.

Other environmental impacts

Apart from greenhouse gases, natural gas and petroleum exploration and development have other significant environmental impacts, and these will also grow as the industry expands. For example, pipelines, seismic lines and drilling rigs require servicing roads and land clearing, often in areas which had previously been undisturbed natural wilderness. These activities increase the likelihood of other forms of resource exploitation and development, such as forestry and mining, and the attendant habitat disruption.[59]

In addition, processing, production and transportation of the fossil fuels themselves results in local and regional air pollution. For example, in Alberta, a recent report by the Parkland Institute found that increasing gas exports will bring on stream many new wells containing high concentrations of hydrogen sulphide, with their associated environmental risks. Currently, there are 5,000 gas flares emitting sulphur and other toxic compounds into the environment.[60] And, of course, there are air, land and water impacts from pipeline ruptures and oil spills.

Apart from greenhouse gases, natural gas and petroleum exploration and development have other significant environmental impacts, and these will also grow as the industry expands.



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Projections of greenhouse gas emissions from expanded production

A review of some of the energy projects currently being planned in Canada shows that greenhouse gas emissions will continue to increase dramatically in the next 10 years.

A review of some of the energy projects currently being planned in Canada shows that in the next 10 years greenhouse gas emissions will continue to increase dramatically. While this chart is based on planned, rather than existing, projects it by no means includes all of Canada's potential fossil-fuel based energy projects – many of which are in more preliminary phases of planning.

GROWTH IN ANNUAL GREENHOUSE GAS EMISSIONS FROM PLANNED TAR SANDS PROJECTS, NEW COAL AND GAS-FIRED POWER PLANTS AND NEW GAS DEMAND BY 2010

NEW ENERGY SOURCE	ADDITIONAL ANNUAL EMISSIONS (CARBON DIOXIDE EQUIVALENTS) BY 2010
Alberta Tar Sands Expansion[61]	60 megatonnes
Atlantic Offshore Oil Production	2 megatonnes
Northern Natural Gas	3.8 megatonnes
Conventional Natural Gas Expansion	15 megatonnes
Electricity Generation	17.3 megatonnes
Total	**98.1 megatonnes**

Comparisons with official Government of Canada forecasts

Various official forecasts of energy supply growth have been made and this analysis has attempted to update, synthesize, and build upon these forecasts in order to determine the expanded level of greenhouse gas emissions.

In 2000, the National Energy Board estimated that the addition of tar sands projects capable of producing 670,000 barrels of synthetic crude and 384,000 barrels of bitumen per day would result in total greenhouse gas emissions from tar sands projects growing from 21 megatonnes in 2000 to nearly 50 megatonnes per year by 2015. [62] This increased oil production would require an additional

14 million cubic metres of natural gas per day, resulting in additional annual greenhouse gas emissions of 10 megatonnes of carbon dioxide just from the combustion of that natural gas. Applying the NEB's emission factors to the more recently announced projects, which total two million barrels per day by 2010, results in greenhouse gas emissions from tar sands growing to 80 megatonnes by 2010.

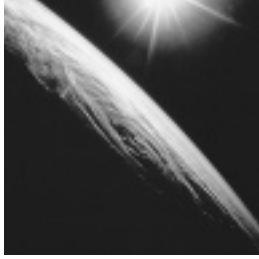
Natural Resources Canada's (NRCAN) 1999 projections for greenhouse gas emissions from fossil fuel production include a number of expanded oil sands projects producing another 700,000 barrels per day by 2010. NRCAN's forecast shows direct emissions from the tar sands production increasing by 15 megatonnes per year and emissions from natural gas production increasing by two megatonnes by 2010.[63] Newly announced oil sands projects can be expected to add at least another 45 megatonnes of greenhouse gases to this projection.

By 2010 our emissions will be 44 per cent above the international commitment made by Canada in the Kyoto Protocol.

In regard to Canadian natural gas production, the NRCAN forecast indicates that by 2010 the US will be importing 106 billion cubic metres annually. However, the most recent forecast by the United States Energy Information Administration indicates that by 2010 the US will be importing 136 billion cubic metres of natural gas from Canada annually.[64] The annual upstream emissions associated with producing the extra 30 billion cubic metres are equal to 11 megatonnes of carbon dioxide.

Similarly, while in the NRCAN forecast coal-fired electricity production was expected to decrease by six per cent below 2000 levels by 2010, recent project proposals in Alberta, show that, instead, it is likely to increase by eight per cent, adding 7.5 megatonnes of greenhouse gas emissions to Canada's total.[65] Should the development of all of these fossil fuel projects proceed as planned and, in the case of natural gas, as the US market demands, Canada's greenhouse gas emissions will increase by a further 63.5 megatonnes above the NRCAN forecast.

NRCAN's 1999 forecast update indicated that Canada's annual greenhouse gas emissions would be 764 megatonnes by 2010. But under current market trends that annual total is likely to be in the vicinity of 827.5 megatonnes. Our commitments under the Kyoto Protocol require our annual emissions to be six per cent below 1990 levels, or 575 megatonnes per year, between 2008 and 2012. In other words, by 2010 our emissions will be 44 per cent above the international commitment made by Canada in the Kyoto Protocol.



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Energy efficiency and renewable energy: the real challenge for Canada and the US

More energy was saved over that 1973–1996 period than all of the new energy supply from new oil, gas, coal, nuclear and hydro resources combined.

By encouraging the expansion of some of the most energy intensive petroleum production in the world, we are increasing our carbon dioxide liability and potential economic exposure. There is an alternative approach that meets energy needs, but unlike the fossil fuel expansion strategy, it also meets domestic and international environmental goals and commitments such as the Kyoto Protocol. That approach, in turn, would then be the cornerstone for a new energy relationship with the US. We need to develop and implement policies which reduce energy demand, save consumers money and reduce emissions. In fact, this is not only necessary for climate protection and for regional air quality improvements, but it is also good for the economy, as earlier energy crises demonstrated.

Due to energy price increases in the 1970's, the energy intensity of the economy actually decreased. Increased fuel prices forced companies to become more energy efficient and government regulations led manufacturers and home builders to produce more efficient products. As a result, between 1973 and the present, economic productivity outpaced growth in energy consumption by 25 per cent. Energy consumption per dollar of GDP fell from 16.57 megajoules (the energy contained in a half litre of gasoline) in 1973 to 12.41 megajoules in 1997.[66]

Without that efficiency gain, Canada's total energy consumption would have been 35 per cent higher for the same level of economic activity. More energy was saved over that period than all of the new energy supply from new oil, gas, coal, nuclear and hydro resources combined.[67] The US Department of Energy estimates that energy savings resulting from efficiency gains in the US economy during this period are currently saving that country between $US150 and $US200 billion per year.

To achieve similar gains in economic and energy efficiency in this era, Canada

and the US must both abandon the current strategy of simply expanding the production and use of fossil fuel energy sources. Instead, we must begin working in partnership with the US, as a purveyor of intelligent energy policy and practical solutions to a growing energy crisis.

However, what is emerging in both nations – more overtly in the US – is an official reluctance to embrace the opportunities for efficiency. For example, Presidents Bush's budget submissions to Congress call for cuts in most efficiency research and implementation programs of approximately 40 per cent. The Bush Administration's approach was perhaps best captured by the President's official spokesperson when he reacted to a media question about the excess energy consumption of Americans in relation to other citizens of the world and the possibility of "correct[ing] our lifestyles":

"That's a big no. The President believes that it's an American way of life, and that it should be the goal of policy makers to protect the American way of life. The American way of life is a blessed one."[68]

More of the same, with the only variable being a constant increase in energy volumes, is not sustainable or in keeping with our international commitments.

Broad-based policies for energy efficiency, cleaner air, and climate protection

In order to build an energy strategy that takes the climate into account, there are many key policy areas that require new and bold leadership initiatives from Canadian governments and industries. These range from proper funding of public transit to air quality standards that safeguard public health. History shows that, in almost every instance, innovation and technological advances in energy-related fields have strengthened the economy, increased energy security (both price stability and supply access) and, most importantly, reduced air pollution of almost all forms, including greenhouse gases.

In an official 1998 submission to the US Environmental Protection Agency, the Government of Canada stated that up to 16,000 Canadians die prematurely each year due to air pollution, and Environment Canada and other agencies estimate the annual medical costs are in the billions of dollars.[69] These impacts and costs alone require a public policy response that, by definition, must alter our approach to energy production and use. More of the same, with the only variable being a constant increase in energy volumes, is not sustainable or in keeping with our international commitments.

The following are some key areas that require new approaches.

A CASE STUDY: MOTOR VEHICLES AND THE POTENTIAL FOR EFFICIENCY AND COST SAVINGS

As outlined, a key driver in the demand for increased oil production, with attendant upstream emissions, is transportation. There are many measures that have the proven potential to reduce the number of vehicles and trips, and the

One policy which is suitable for US-Canada co-operation and which would help both countries substantially reduce gasoline use is the development of new automobile fuel efficiency standards.

distances of those trips: public transit, cycling and other alternatives, car pooling, home-based work, and a renewed emphasis upon sustainable community and neighbourhood planning. With all of these policy improvements, different, more efficient vehicles are also required.

As was previously noted, reducing US demand for gasoline will have direct environmental benefits in Canada. One policy which is suitable for US-Canada co-operation and which would help both countries substantially reduce gasoline use is the development of new automobile fuel efficiency standards. A recent report by the American Council for an Energy Efficient Economy found that by implementing progressively improved fuel efficiency standards for automobiles, the US could reduce its dependency upon oil by nearly five million barrels per day. This goal, which is two and a half times as much oil as the proposed tar sands expansion, could be achieved by applying the technically proven and available technologies outlined below.

TECHNOLOGIES FOR PASSENGER VEHICLE FUEL ECONOMY IMPROVEMENT[70]

TECHNOLOGY	FUEL ECONOMY IMPROVEMENT (PERCENTAGE)
Weight reduction	10-30
Aerodynamics	4-10
Variable valve control	12-16
Direct injection spark ignition	5-23
Other engine refinements	5-10
Improved transmissions	6-14
Hybrid powertrain	40-80

IMPROVING THE ENERGY EFFICIENCY OF RESIDENTIAL AND COMMERCIAL BUILDINGS

Canada's R-2000 and C-2000 programs for building efficiency should be adopted as residential and commercial building standards. If these standards are beyond the jurisdiction of federal statute, then a federal financing program which eliminates the difference in price between R-2000 or C-2000 and a regular building should be implemented. With government incentives, this program could ensure that Canada's housing and building stock becomes 35-40 per cent more energy efficient than today's conventional buildings, resulting in major, ongoing economic savings as well as environmental savings.

This will not only help reduce the need for coal fired power plants, but will also reduce demand for natural gas, which in turn helps natural gas compete with coal for utility power projects. In addition, Canada can assist the residential, commercial and institutional building sector by providing funds for retrofit projects throughout the country, thereby providing real security against the higher

energy prices that are arising from the overheated continental energy market. At the same time, building retrofit projects are significant sources of new employment and, in commercial and industrial settings, often result in productivity gains that flow from improved lighting, ventilation, and indoor air quality.[71]

MOVING MORE FREIGHT MORE EFFICIENTLY: BY RAIL INSTEAD OF ROAD

Rail already moves 60 per cent of overland freight in Canada, yet accounts for less than 15 per cent of greenhouse gas emissions in the overland freight sector. This is because moving an item by truck over a given distance requires about six times more energy compared to moving it by rail.[72] Canada's railways have the ability to increase their freight capacity and also have exceptionally competitive freight rates – the lowest per ton-mile of all railways in the industrial world.

This mode shift would substantially reduce the amount of diesel fuel being used in Canada today and help reduce the cost of road repairs, while also reducing greenhouse gas emissions and common air pollutants such as particulates and smog-forming compounds. Such a shift must be encouraged by pricing and taxation changes that include in the price of moving freight by truck all of the 'external' costs such as those associated with highway damage, air pollution, public health, and climate change. As well, public policies must encourage local commerce, and alternatives to 'just in time delivery' in order to reduce overall demands to move more freight more kilometres more frequently.

REGULARLY REVIEW AND UPDATE STANDARDS FOR MAJOR APPLIANCES AND INDUSTRIAL EQUIPMENT

Standards create the economies of scale which transform the market for high efficiency equipment. As the marketplace changes and more efficient equipment is developed, standards must be implemented which raise the basic level of energy efficiency. This allows for, and encourages, continuous improvement. Without such improvements in standards, newly designed equipment is less price competitive, even though consumers save money over the long run due to reduced operating costs. Within the existing supply of appliances and equipment most of the manufacturers' capital costs have been recovered, therefore, the poorest-performing equipment continues to be priced lower than newer-designed, more efficient equipment.

Updated standards remove that disadvantage against innovation and technological improvement and encourage constant upgrading, thereby cutting energy waste and the costs of that waste. For example, the $US12 billion that the US Department of Energy has invested in energy efficiency since 1978 is estimated to have saved US consumers $US100 billion in avoided energy expenditures.[73] By reducing energy demand through improved standards, the financial and ecological costs of energy development and use are likewise reduced.

The $12 US billion that the US Department of Energy has invested in energy efficiency since 1978 is estimated to have saved US consumers $100 US billion in avoided energy expenditures.

It is worth noting that wind power is increasingly competitive with new natural gas-fired sources of electricity and is now the fastest growing source of new energy in the world, sparking major new industries and technological development.

PROMOTE AND ENCOURAGE RENEWABLE ENERGY SOURCES

In order to create a level playing field for renewable energy, the federal government should provide incentives for the development of low impact renewable sources of electricity such as wind, solar and micro-hydro, as well as removing fossil fuel subsidies. These incentives may be used to encourage utilities to purchase renewable energy, or to encourage producers to build new projects, from which the electricity can be marketed. This would help curtail the growth in fossil fuel electricity generation and reduce greenhouse gas emissions. Proper incentives, coupled with renewable energy mandates for utilities from provincial regulatory agencies, are critical elements of a successful strategy to develop cleaner energy sources.

It is worth noting that wind power is increasingly competitive with new natural gas-fired sources of electricity and is now the fastest growing source of new energy in the world, sparking major new industries and technological development. Rapid growth is also underway in the solar, biomass (wood and agricultural waste), micro-hydro, ground source, and geothermal energy sectors. Research also promises more advances in wave, tidal and hydrogen-based energy. Again, these are areas for economic opportunity and energy security that Canada can compete in while meeting its responsibility for climate protection.

ECONOMIC INSTRUMENTS

As a means of encouraging the adoption of renewable technologies by utilities and other users of electricity, and in order to achieve the Kyoto climate treaty target in a cost effective manner, the federal government should quickly implement an economy-wide economic instrument such as a carbon tax, or a domestic carbon trading system with an enforced national cap on overall emissions. This would help begin the process of integrating the environmental cost of fossil fuel pollution into the market price for energy and thereby eliminate some of the unfair advantage which is currently enjoyed by fossil fuels.

There are many examples of both carbon tax and 'cap and trade' systems in industrialized nations that can inform the development and implementation of either or both policies in Canada and in the US. Many incorporate revenue recycling features that use new energy-related revenues to fund efficiency improvements and cost savings that, in turn, balance new energy prices and/or taxes. The challenge for Canadians is to move forward gradually now with these approaches, so as to avoid more difficult 'shocks' in energy costs later. While actions on climate change and sustainable energy policies can obviously be delayed, they are inevitable and our society can more easily handle planned, gradual changes.

Conclusion: Canada's energy choices and climate responsibilities

Canada is at an important point in the determination of energy policy, which, by definition, will largely shape the policy on climate protection as well. On the one hand, the federal, provincial and territorial governments can simply accept the dictates of US-driven energy markets and collaborate with both the petroleum industry and Washington, D.C. to facilitate and encourage the proposed massive expansion of fossil fuel production and use.

On the other hand, public policies can be developed and implemented that put our international commitments on climate change first, climate science first, and public health first, by moving to energy efficiency and renewable energy sources. But to date, Canada is largely ignoring this option, and adopting the former in the emotionally-charged atmosphere of the California electricity deregulation crises, gasoline price increases in the US and 'boom times' for Canada's fossil fuel producers.

The current drive by Ottawa decision makers and other stakeholders for the first option is rapidly increasing Canada's greenhouse gas emissions and our economic dependence on fossil fuels. By so doing, we are moving towards *de facto* violation of international treaties and commitments made by Canada as part of our responsibilities as global citizens and in line with the expectations of Canadian citizens. The major new energy projects planned in the tar sands, in the northern gas fields and in the offshore regions will dwarf any small advances made through new and announced climate protection efforts. That is illustrated by the rapidly growing 'Kyoto gap' illustrated in this report.

Despite the windfall of royalty payments and the often short-term benefits of regional economic growth which some governments are currently enjoying, Canadians will clearly pay a price for the present approach. Whether through continuing increases in fuel bills as a result of the intense US demand for natural gas and electricity, or through health impacts caused by poor air quality from fossil fuel pollution, the costs will be significant and will be borne by Canadians across the country, most of whom gain little or no benefit from increased energy exports. In addition, as the impacts and costs of global warming and climate change become more apparent, the need for action will become more immediate.

However, since most governments are in the process of actively encouraging companies to invest billions of dollars in fossil fuel production they may well be unwilling to restrict emissions from this industry, even though Canada will be one of the most severely impacted countries from early climate change. Therefore, when effective emission reduction measures are eventually seen as unavoidable, other sectors of the Canadian economy will have to compensate for the rapid growth in the fossil fuel industries' share of overall greenhouse gas emissions. In essence, our economic wagon is being hitched to the horses of the fossil fuel

Industry and government are ignoring the glaring contradiction between the science of climate change and the policy of fossil fuel expansion.

The responsibility for the greenhouse gas emissions of today and the coming decades rests squarely with the decision makers who are facilitating the increases in those emission levels.

industry, without a thorough and accountable public examination of the alternatives. In reference to the current focus in Ottawa, one investment analyst stated "with this administration, it's energy, energy, energy."[74] Unfortunately, that approach is ignoring the climate change threat that comes with it.

As a developed nation with the economic power to invest in energy efficiency and the technological capabilities to develop new and renewable sources of power, Canada's current energy path makes no sense by any standard. As a recent business editorial suggested: "Canada needs to make it clear that if our energy is for sale, the price is a balanced, comprehensive continental policy that promotes efficiency as well as the development of new energy sources."[75] Instead, in all of the public pronouncements on the need for a continental energy policy and the opportunities for Canada in the US market, energy efficiency and conservation are given mere lip service and renewable energy is completely marginalized. Industry and government are ignoring the glaring contradiction between the science of climate change and the policy of fossil fuel expansion.

The challenge to address that glaring contradiction cannot be left to the future generations that will face the growing costs and impacts of climate change. The responsibility for the greenhouse gas emissions of today and the coming decade rests squarely with the decision makers who are facilitating the increases in those emission levels. As Environment Minister David Anderson stated in an address on the need to respond to climate change:

> "And the test of our actions today is how they will be remembered in generations to come. What will the generation that greets the 22nd century say of the generation that entered the 21st?
>
> Do we want our great grandchildren to look back on us a hundred years from now and remember us as a generation too caught up in the rising stock market and short term political posturing to do anything about the fate of the earth?"[76]

With unrestrained US energy demand and a continental market poised to drive greenhouse gas emissions 44 per cent above our Kyoto Protocol limit, it is indeed time to answer Mr. Anderson's questions before the major decisions are made. The global climate depends upon it.

NOTES

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