STATE OF THE WEST ENERGY

2012 Western Canadian Energy Trends

Michael Holden, Senior Economist
Robbie Rolfe, Policy Analyst

energy | CanadaWest FOUNDATION

A Powering Up for the Future Report

The global search for more energy combined with the ongoing anxiety about carbon form the backdrop of the Canada West Foundation's *Powering Up for the Future Initiative*. The initiative facilitates constructive debate on energy policy and promotes the vital importance of western Canadian energy resources to the national, continental and global economy. We are working hard to ensure that western Canadian aspirations and concerns are heard within the national debate and to demonstrate the value of a Canadian energy strategy that is built from the provinces up rather than Ottawa down.

Acknowledgements

This report was prepared by Canada West Foundation Senior Economist Michael Holden and by Robbie Rolfe, Policy Analyst. The authors wish to thank Ryan Pike and Anna Columbos for their significant research contribution and for producing early drafts of several sections of this document. Thanks also go out to Robert Roach for his oversight and editorial input. Notwithstanding his efforts, any remaining errors or omissions are the responsibility of the authors.

Finally, and most importantly, this document would not have been possible without the extraordinary layout and design work of Sophie Lacerte. All credit for the appearance of the final product belongs to her and is the result of her skill and considerable effort.

ISBN 978-1-897-423-93-6

energy | Canada West FOUNDATION

CONTENTS

STATE OF THE WEST: ENERGY

Foreword

As a kid growing up in Calgary in the 1970s I was introduced to the world of energy—especially oil and gas—at a young age. I remember a presentation to one of my elementary school classes during which we got to look at a jar full of oily sand. The friendly fellow making the presentation spoke of the potential energy locked in the ground of northern Alberta near Fort McMurray.

Climate change meant nothing to me at the time, other than what the weather had in store over the next few days. I had a vague sense that electricity did not just magically appear when I plugged in my record player but I did not know exactly how it was generated. I had a solar-powered calculator that I thought was pretty neat and I knew that Arab Sheiks were somehow mixed up in an energy crisis in the US.

Today, the oil sands are a major source of oil production and climate change has incited a war on carbon that, although quieted by recent economic hiccups, does not appear to be going away. At the same time, economic growth in China is creating all sorts of opportunities for western Canada's energy producers.

The Middle East and its oil remain an active fault line in the energy world, so that remains the same. Another constant amid the change is the economic importance of energy production to the western Canadian economy. This importance lies in both the region's energy exports and in its access to relatively inexpensive and reliable energy sources for its own use.

What all this points to is the need to get a better grip on the main contours of the contemporary world of energy and to take stock of the trends that are shaping energy production and consumption in western Canada.

State of the West: Energy is designed to do just that. By pulling together a wide range of disparate bits and pieces of energy information and making sense of them, this report provides everyone interested in western Canada's energy future with the context they need to understand where we are at today and where things might go in the future.

Preface

Western Canada is blessed with an abundance and diversity of energy resources. Energy shapes our region. It creates jobs, fuels the economy and provides revenue to governments – revenue used to finance infrastructure and to provide health care and other public services. However, the influence and importance of energy to western Canada extends far beyond the benefits derived from its production. Western Canadians are also major consumers of energy as well.

As this report demonstrates, the energy picture in western Canada is far from homogenous. For one, the energy resources of each province are very different. Similarly, energy consumption levels vary across the four provinces, as do the environmental effects of energy production and use.

This report provides the reader with an overview of the provincial energy systems in western Canada – including the current state of energy production, consumption and other related activity and effects – and frames that information in the context of the energy-related policy issues and challenges facing the four western provinces. While no such document could ever hope to provide a comprehensive summary and analysis of the myriad aspects of energy in western Canada, the goal here is to provide a one-stop information resource on energy in western Canada that provides basic information to the lay reader and, in turn, inform the debate surrounding energy policy.

There is one important caveat to the statistics in this report, and it concerns uranium. The energy value of uranium produced in Saskatchewan for 2010 exceeds the energy value of all oil produced in Canada in 2010. However, this value is not included in this report, which follows the Statistics Canada convention of only showing the energy value for uranium as primary energy for the provinces that produce nuclear power. The great bulk of Saskatchewan's uranium production is exported to the world and is not counted by Statistics Canada as Canadian energy production or energy exports.

ABBREVIATIONS

Alberta	**AB**
Atlantic	**Atl**
British Columbia	**BC**
Manitoba	**MB**
New Brunswick	**NB**
Newfoundland and Labrador	**NL**
Northwest Territories	**NT**
Northwest Territories, Nunavut, Yukon	**Terr**
Nova Scotia	**NS**
Nunavut	**NU**
Ontario	**ON**
Prince Edward Island	**PE**
Quebec	**QC**
Saskatchewan	**SK**
Yukon	**YT**
Canada	**Can**
BC, Alberta, Saskatchewan, Manitoba	**West**
Rest of Canada (Canada less the West)	**RoC**

ENERGY PRODUCTION & RESERVES

86.8%
of primary energy production in Canada occurred in the western provinces in 2010

97.8%
of Canada's total marketable natural gas reserves are in the Western Canadian Sedimentary Basin

100%
of uranium production in Canada occurs in Saskatchewan

On a per capita basis, Manitoba is the second largest producer of hydroelectricity in Canada

13
of Canada's 22 oil refineries are in western Canada

32.4%
of wind power generation in Canada takes place in the West

100%
of coal production in Canada takes place in Alberta, British Columbia and Saskatchewan

Introduction

Western Canada is known for its abundant energy resources. Whether it is coal, oil, natural gas, uranium or hydroelectricity, each western province is blessed with a rich energy endowment. Moreover, each province has considerable untapped potential to expand on its existing energy production levels.

Without question, Alberta is the dominant energy producer in the West and, indeed, across Canada. The oil sands hold the third largest economically recoverable crude oil reserves in the world and are a magnet for investment and a key driver of economic growth in the province. The development of the oil sands only adds to Alberta's existing strengths as Canada's largest source of natural gas and home to vast reserves of coal. The potential for future expansion in the oil sands as well as opportunities in unconventional gas production and alternative energy make Alberta Canada's energy leader.

British Columbia is the second largest source of energy in western Canada. Natural gas and high-value metallurgical coal are the province's two most important energy assets, although BC is also home to significant hydroelectric capacity. In addition, there is tremendous potential for BC to develop its own unconventional natural gas deposits.

While BC is Canada's second largest energy producer in absolute terms, Saskatchewan produces more energy on a per capita basis than any province except Alberta. Saskatchewan also has perhaps the most diversified energy portfolio in the region. Like Alberta, it is home to significant coal and natural gas deposits (including vast unconventional reserves), but also growing heavy oil production, untapped oil sands potential and some hydroelectric capacity as well. In addition, Saskatchewan is the second largest producer in the world of uranium, and holds the world's third largest reserves of that resource.

Manitoba is by far the smallest energy producer in western Canada. Situated on the eastern end of the Western Canadian Sedimentary Basin, Manitoba does not have the oil and gas reserves of Alberta or even Saskatchewan. However, Manitoba is second only to Newfoundland and Labrador in terms of per capita hydroelectricity generation. The potential also exists for Manitoba to increase its current levels of crude oil production. The Bakken formation, which, on its north end, straddles Saskatchewan and Manitoba, is a potentially vast deposit of crude oil.

Because of the tremendous differences in resource endowments and output levels across the region, it is difficult to view western Canada as a cohesive unit when it comes to energy production. However, this diversity is also the region's strength. Thanks to the significant contributions from, and untapped potential in, each of the four provinces, western Canada is indisputably the country's energy leader.

Primary Energy

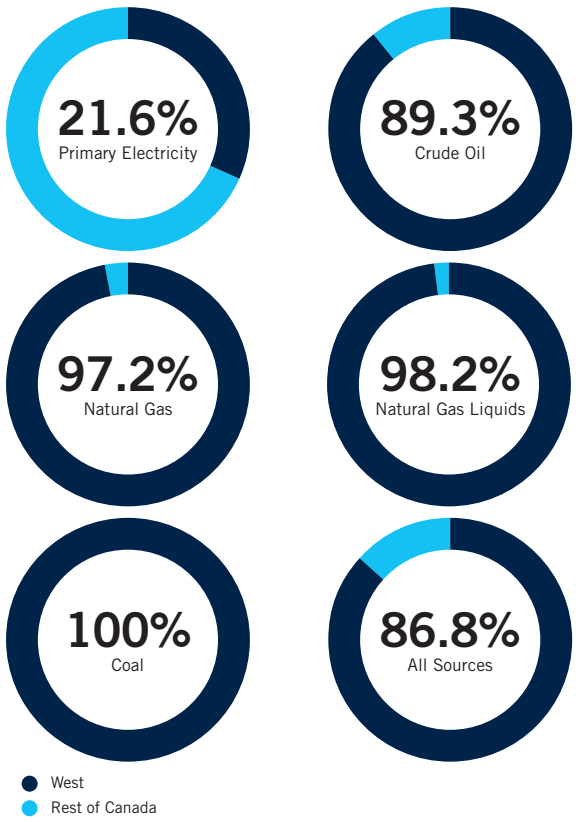
PRODUCTION — OVERVIEW

The western provinces dominate energy production in Canada. While the source of energy varies considerably from province-to-province, the region as a whole accounted for 86.8% of national primary energy production in 2010. Together, the four western provinces accounted for 89.3% of Canada's crude oil recovery; 97.2% of natural gas extraction; 98.2% of natural gas liquids (NGLs) production; and 100% of coal mining.

Alberta is Canada's energy superpower, producing more energy than all other provinces and territories combined. It is Canada's largest producer of conventional crude oil, synthetic crude, natural gas and natural gas liquids, and the second largest producer of coal, behind BC.

Primary electricity – that which is not generated by the consumption of other fuels – is the only form of primary energy production not dominated by western Canada. Quebec is the national leader in primary electricity generation because of its abundance of developed hydroelectricity capacity.

Western Canada's Share of National Primary Energy Production 2010



Primary Energy Production 2010

British Columbia

	petajoules	% of Canadian production
Coal	697.9	46.2
Crude oil	49.6	0.8
Natural gas	1,275.5	21.2
Natural gas liquids (NGLs)	39.4	6.4
Primary electricity	193.2	12.1
TOTAL	**2,255.5**	**14.1**

Alberta

	petajoules	% of Canadian production
Coal	657.4	43.6
Crude oil	4,456.2	71.8
Natural gas	4,316.8	71.7
Natural gas liquids (NGLs)	562.8	91.5
Primary electricity	14.1	0.9
TOTAL	**10,007.4**	**62.8**

Saskatchewan

	petajoules	% of Canadian production
Coal	154.0	10.2
Crude oil	962.5	15.5
Natural gas	258.1	4.3
Natural gas liquids (NGLs)	2.1	0.3
Primary electricity	15.7	1.0
TOTAL	**1,392.5**	**8.7**

Manitoba

	petajoules	% of Canadian production
Coal	0.0	–
Crude oil	72.6	1.2
Natural gas	0.0	–
Natural gas liquids (NGLs)	0.0	–
Primary electricity	121.0	7.6
TOTAL	**193.6**	**1.2**

Note: Data refer to primary energy production only. Secondary energy, such as electricity generated from burning coal or refined petroleum products, is not included.
Source: Statistics Canada Table 128-0016.

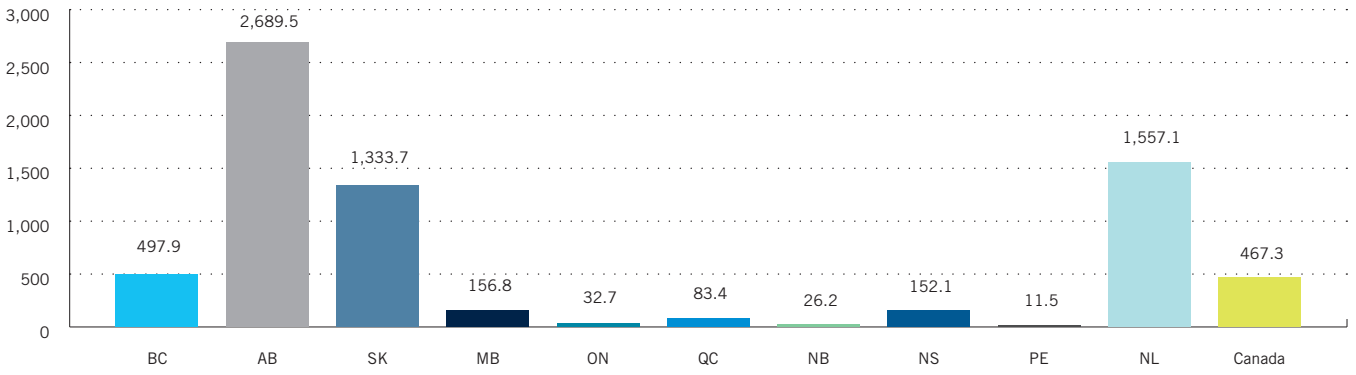
Primary Energy

PRODUCTION PER CAPITA

Western Canada's dominance of Canadian energy production is even more apparent when the region's population is considered. On a per capita basis, western Canada produced 1,315 gigajoules (GJ) of energy in 2010, close to three times the national average.

Three of Canada's four largest per capita energy-producing provinces are in the West. Alberta leads the way, generating 2,690 GJ of energy per person in 2010. Per capita energy production in Alberta is close to six times the national average. At 1,334 GJ per capita, Saskatchewan is the second largest energy producer in the West on a per person basis and third largest in Canada, slightly behind Newfoundland and Labrador. BC is the fourth largest per capita energy producer in Canada, while Manitoba sits in fifth position.

Per Capita Primary Energy Production in Canada 2010 (gigajoules per capita)



Note: Data refer to primary energy production only. Secondary energy, such as electricity generated from burning coal or refined petroleum products, is not included.
Source: Canada West Foundation calculations using data from Statistics Canada Tables 129-0016 and 51-0001.

Per Capita Primary Energy Production by Type 2010 (gigajoules per capita)

	BC	AB	SK	MB	West	RoC	Canada
Coal	154.1	176.7	147.5	–	143.3	–	44.2
Crude oil	10.9	1,197.6	922.0	58.8	526.2	28.4	181.9
Natural gas	281.6	1,160.1	247.2	–	555.6	7.3	176.4
Gas plant natural gas liquids (NGLs)	8.7	151.3	2.0	–	57.4	0.5	18.0
Primary electricity, hydro and nuclear	42.7	3.8	15.1	98.0	32.7	53.3	46.7
TOTAL	**497.9**	**2,689.5**	**1,333.7**	**156.8**	**1,315.3**	**89.4**	**467.3**

Note: Data refer to primary energy production only. Secondary energy, such as electricity generated from burning coal or refined petroleum products, is not included.
Source: Canada West Foundation calculations using data from Statistics Canada Tables 129-0016 and 51-0001.

Crude Oil

PRODUCTION

Thanks to development of the oil sands, Alberta is by far the largest source of crude oil in Canada. Total production in Alberta reached 121.6 million cubic metres in 2010, more than two-and-a-half times greater than the total volume of oil extracted from the rest of Canada combined. At 86.9 million cubic metres in 2010, the oil sands accounted for 71.4% of total crude oil production in Alberta and 51.9% of oil extraction nationwide that year.

Alberta is also the largest source of conventional crude oil in Canada, although conventional oil production has been in a long-term decline since the mid-1970s as reserves are slowly being depleted; total conventional crude oil production in Alberta in 2010 was less than one third of 1973 levels.

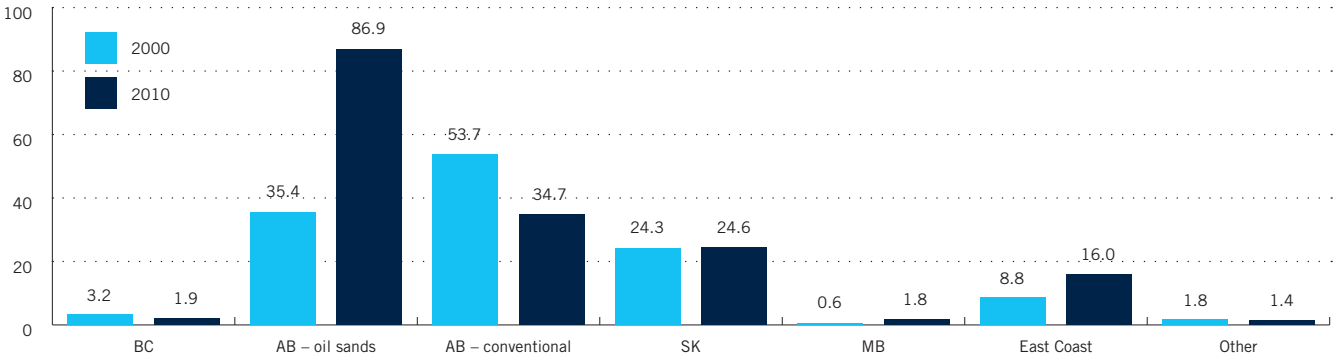
Saskatchewan is the second-largest oil producer in Canada, extracting 24.6 million cubic metres of the liquid in 2010.

Major International Crude Oil Producers 2010

		000s of cubic m/day	% of world production
01	**Russia**	1,538.1	13.1
02	**Saudi Arabia**	1,415.0	12.0
03	**United States**	876.3	7.4
04	**Iran**	648.7	5.5
05	**China**	648.1	5.5
06	**Canada**	434.6	3.7
07	**Mexico**	409.5	3.5
08	**Nigeria**	390.4	3.3
09	**United Arab Emirates**	383.9	3.3
10	**Iraq**	381.5	3.2

Source: US Energy Information Administration.

Crude Oil Production in Canada (millions of cubic metres)



Note: Includes crude oil equivalents such as condensates and pentanes plus.
Source: Statistics Canada Table 126-0001.

Crude Oil

RESERVES

Western Canada is home to some of the largest crude oil deposits in the world. Estimates of economically recoverable reserves (27.9 billion cubic metres in 2011) rank Canada third in the world, behind only Saudi Arabia and Venezuela. Canada is the only non-member of the Organization for Petroleum Exporting Countries (OPEC) in the top five in global crude oil reserves.[1]

The vast majority – nearly 98% – of Canada's crude oil reserves are in western Canada, almost exclusively in the oil sands of north eastern Alberta.[2] Alberta's oil sands, which stretch across 140,200 km^2 of land, contain an estimated 286 billion cubic metres of oil, of which about 10% is recoverable using current technology.[3]

Alberta has larger crude oil reserves than energy giants such as Iran, Iraq and Kuwait.

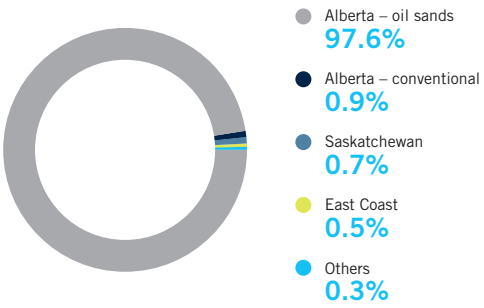
[1] US Energy Information Administration. 2011. *Country Analysis Briefs: Canada.*
[2] Canadian Association of Petroleum Producers. 2010. *The Facts on Oil Sands.*
[3] Alberta Energy. 2010. *Facts and Statistics.*

56%

OF THE GLOBAL OIL RESERVES OPEN TO PRIVATE SECTOR INVESTMENT ARE FOUND IN THE OIL SANDS

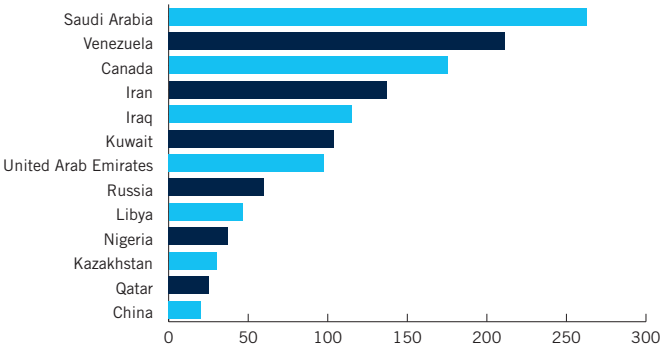
Source: Canada Association of Petroleum Producers.

Established Oil Reserves in Canada 2010



Source: CAPP Statistical Handbook 2011.

Proved Oil Reserves (billions of barrels)



Note: Proved reserves are those quantities of petroleum which, by analysis of geological and engineering data, can be estimated with a high degree of confidence to be commercially recoverable from a given date forward, from known reservoirs and under current economic conditions. Data for Canada includes recoverable reserves in the oil sands.
Source: US Energy Information Administration.

Crude Oil

PRICES

Notoriously volatile even before the 2000s, oil prices have fluctuated dramatically in recent years. From an average of US$26.16 in 2002, the price of a barrel of West Texas Intermediate (WTI – the most common benchmark price for crude oil) rose to more than US$100 in 2008, before tumbling back to US$61.92 in 2009. By the end of 2011, the price for a barrel of WTI was back up around US$100.

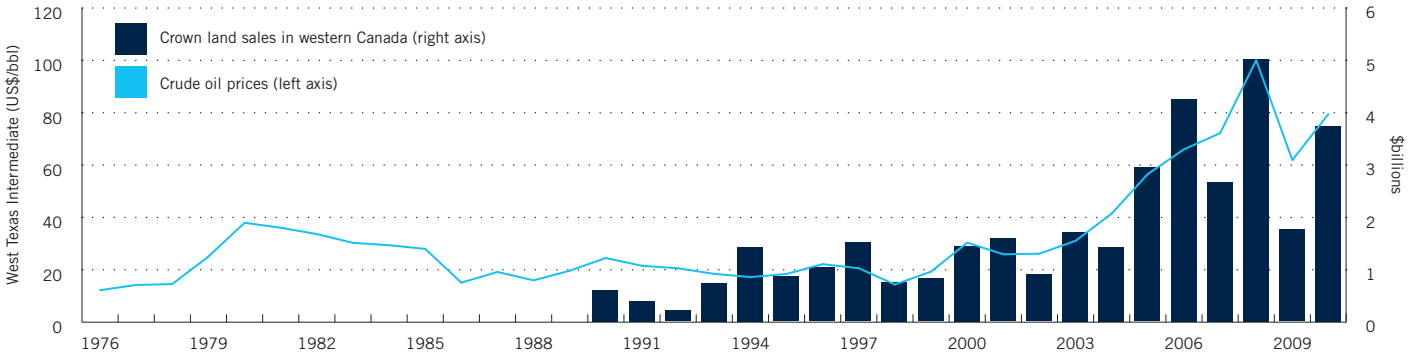
High oil prices have been a boon to energy producers in western Canada, especially for those involved in the Alberta oil sands. As oil prices rose in the mid-2000s, oil sands exploration and development took off. Crown land sales in the oil sands rose from 64,351 hectares in 2003 (when oil was US$31.07 a barrel) to 1.7 million hectares in 2008. When oil prices fell in subsequent years, Crown land sales followed suit.

The western Canadian oil industry will be increasingly sensitive to oil prices in the years ahead. As easy-to-reach reserves dry up, conventional oil is becoming more costly to extract and, while bituminous oil is easier and cheaper to find than conventional oil, its production costs are higher.

$51.93

DIFFERENCE BETWEEN THE AVERAGE PRICE OF A BARREL OF WTI IN JANUARY 2008 COMPARED TO DECEMBER 2008

Crude Oil Prices and Crown Land Sales in Western Canada



Note: Data on Crown land sales in western Canada are not available before 1990.
Sources: CAPP Statistical Handbook 2011; BP *Statistical Review of World Energy, June 2010*.

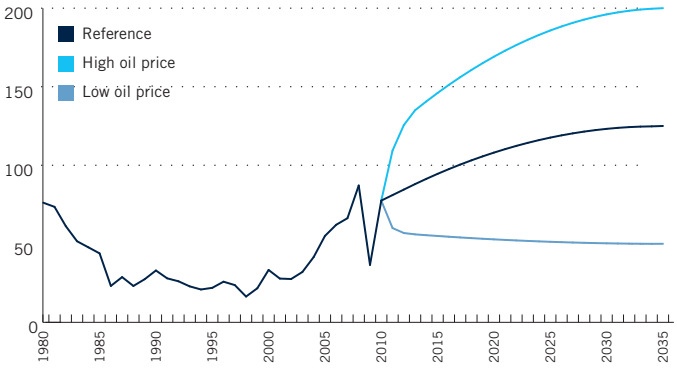
Crude Oil

PRODUCTION OUTLOOK

Expectations regarding future oil prices will be a key determinant of exploration and development activity in western Canada in the years ahead. Considerable potential remains to expand oil production in the region, both in the oil sands (in Alberta as well as Saskatchewan) as well as in promising new conventional oil plays. However, because companies tend to extract the easiest-to-reach and most profitable oil first, that which remains is generally more expensive to develop and, therefore, more sensitive to price levels.

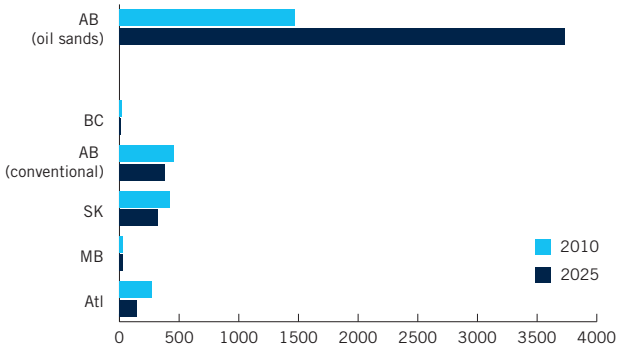
Increased production costs mean that the breakeven price of future investment projects will likely be greater than in the past and that strong oil prices are required for such projects to be economically viable. However, future oil prices are difficult to predict. In its most recent energy outlook, the US Energy Information Administration projected oil prices through to 2035 using three alternate scenarios. The final price ranged from an inflation-adjusted US$50 a barrel to US$200 a barrel.

Average Annual World Oil Prices in Three Cases 1980-2035 (2009 US dollars per barrel)



Source: US Energy Information Administration, *Annual Energy Outlook 2011*.

Canadian Oil Production Projections
(000s of barrels per day)



Source: CAPP Canadian Crude Oil Production Forecast 2011–2025.

Refined Petroleum

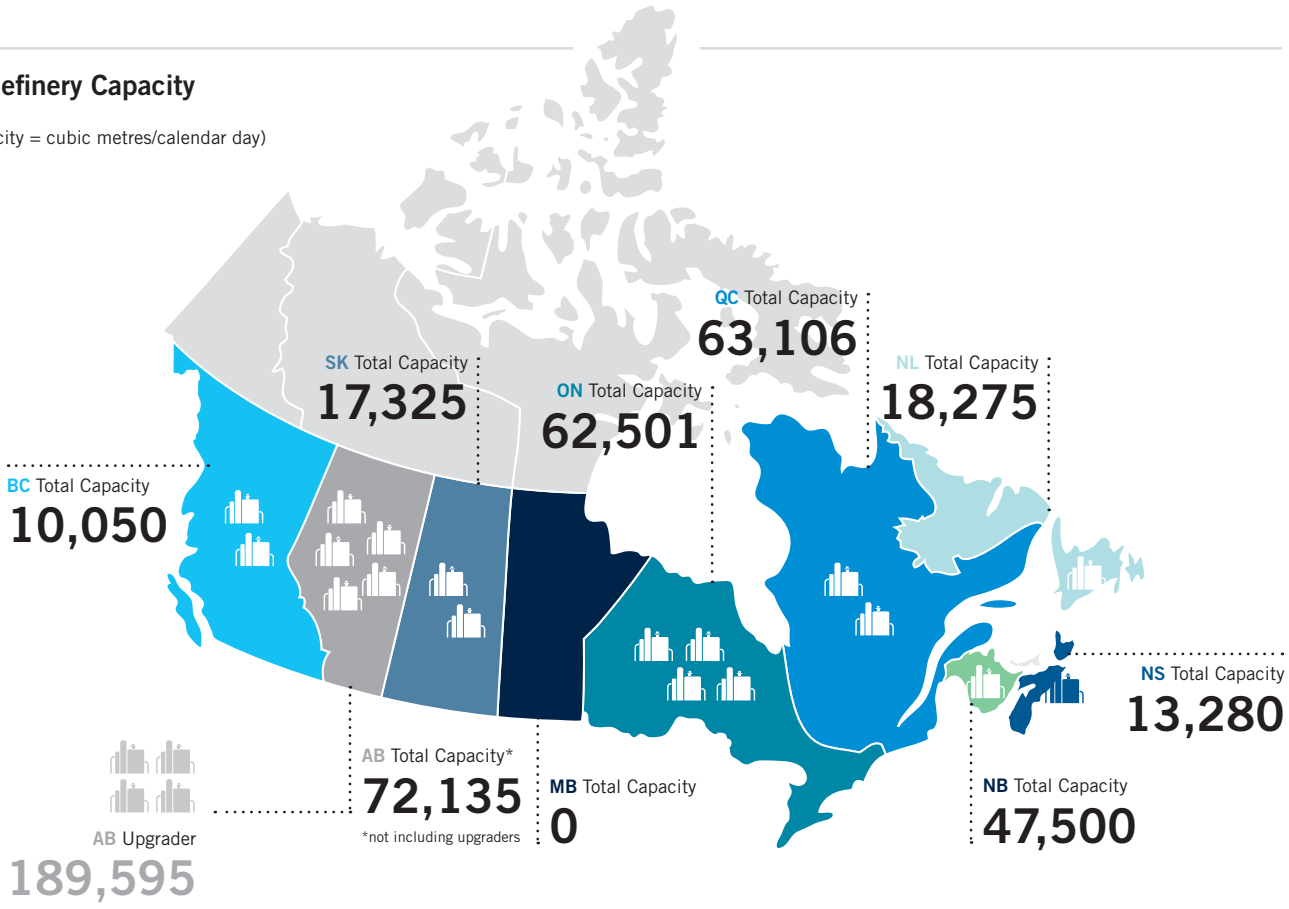
CAPACITY

Thirteen of Canada's 22 oil refineries – accounting for 58.6% of national oil refining capacity by output volume – are found in western Canada. However, a significant share of the region's refining capacity is devoted to the upgrading of bitumen from the oil sands into synthetic crude oil. Four of western Canada's five largest refineries – accounting for nearly two thirds of the region's refining capacity – are oil sands upgraders.

With five facilities, Alberta has the second largest refinery capacity of any province in Canada (behind Quebec), but western Canada as a whole accounts for just 32.7% of national refining capacity (not including upgraders). In spite of the fact that crude oil production in the region has grown considerably over the years, total refining capacity in the West (not including oil sands upgraders) is only slightly higher than in the mid-1980s.

2010 Refinery Capacity

(Total capacity = cubic metres/calendar day)



Source: CAPP Statistical Handbook 2011.

Refined Petroleum

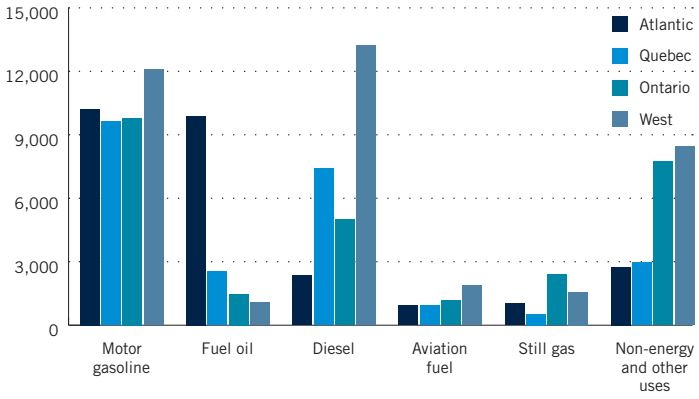
PRODUCTION

In 2010, the western provinces produced 38.3 million cubic metres of refined petroleum products, equivalent to 33% of national output. Most of that refining activity (28.7 million cubic metres or 75%) took place in Alberta. About a third of the remaining western Canadian production took place in BC with Saskatchewan accounting for the other two-thirds. Manitoba has no petroleum product refining capacity.

The 78.7 million cubic metres of refined petroleum production that took place outside the West was relatively evenly distributed across Ontario, Quebec and Atlantic Canada.

There is some noticeable variation in the types of refined petroleum products made across Canada. The Atlantic provinces are major producers of fuel oil, used largely in home heating in that region. Ontario produces a relatively large share of non-energy products such as petrochemical feedstocks, oil-based lubricants and asphalt. For their part, the western provinces produce a large share of Canada's diesel fuel, gasoline and still gas (used to fuel refineries).

Refined Petroleum Production by Type 2010
(000s of cubic metres)



Source: Statistics Canada *The Supply and Disposition of Refined Petroleum Products in Canada.*

Refined Petroleum Production by Type 2010

(000s of cubic metres)

	liquefied petroleum gases (LPGs)	still gas	motor gasoline	kerosene and stove oil	diesel fuel oil	light fuel oil	heavy fuel oil	petroleum coke	aviation gasoline	aviation turbo fuel	non-energy products	total refined petroleum
Canada	3,429	5,509	41,724	740	27,984	7,917	7,051	1,365	80	4,829	16,374	117,002
Atlantic	x	1,029	10,218	8	2,359	6,515	3,366	x	–	920	x	27,153
Quebec	x	535	9,621	1	7,414	775	1,751	x	42	896	x	24,010
Ontario	1,005	2,383	9,787	153	4,986	623	854	407	–	1,167	6,174	27,538
West	x	1,563	12,098	578	13,225	4	1,080	x	38	1,846	x	38,301
of which:												
Alberta	587	1,320	8,597	–	10,605	–	735	342	38	1,485	4,957	28,665

Note: 1) x = suppressed to protect business confidentiality.
Note: 2) Figures may not add due to rounding.
Source: Statistics Canada *The Supply and Disposition of Refined Petroleum Products in Canada.*

Natural Gas

PRODUCTION

Because of large production volumes in Alberta and rising output in BC, natural gas is the single largest source of energy in Canada, accounting for about 37% of all primary energy production nation-wide. Canada is the fourth largest producer of natural gas in the world.

Western Canada accounts for nearly all the natural gas produced in Canada – 95.4% of national production (by volume) in 2010. About 73.5% came from Alberta alone. However, because of declining conventional reserves and lower prices, natural gas production in Alberta is falling. Production in 2010 (139.4 billion cubic metres) was 20.9% below peak levels in 2000. Production is also declining in Saskatchewan, where 2010 production levels (6.8 billion cubic metres) were 29.5% below the 2006 peak.

By contrast, BC is becoming a more important source of natural gas in Canada. Thanks in part to the development of unconventional reserves in the province's northeast, gas production in the province has risen from 25.2 billion cubic metres in 2000 to 34.8 billion ten years later. BC accounted for 19.7% of national output in 2010.

95.4%

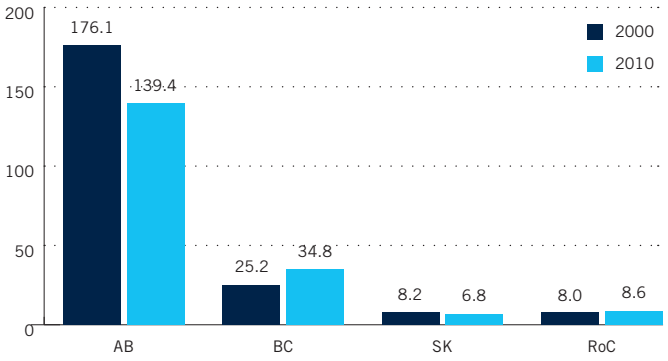
WESTERN CANADA ACCOUNTS FOR NEARLY ALL THE NATURAL GAS PRODUCED IN CANADA

Major International Natural Gas Producers 2010

		Billions of m^3	% of world production
01	**United States**	611.0	19.3
02	**Russia**	588.9	18.6
03	**European Union**	182.3	5.8
04	**Canada**	152.3	4.8
05	**Iran**	138.5	4.4
06	**Qatar**	116.7	3.7
07	**Norway**	106.3	3.4
08	**China**	96.8	3.1
09	**Algeria**	85.1	2.7
10	**Indonesia**	82.8	2.6

Source: CIA World Factbook.

Natural Gas Production in Canada
(billions of cubic metres)



Source: Statistics Canada *Energy Statistics Handbook*.

Natural Gas

RESERVES

The Western Canadian Sedimentary Basin (WCSB) contains 97.8% of Canada's total marketable natural gas reserves —an estimated 1.9 trillion cubic metres in 2010. Most of Canada's natural gas reserves (55.1%) are located in Alberta, but a significant share is found in BC (39.4%). Saskatchewan accounts for 3.2% of Canadian gas reserves.

It is important to note that marketable gas reserves are not the known quantity of natural gas in discovered gas fields but that which can be profitably extracted under prevailing market conditions. Marketable gas reserves in the West peaked in 1984 and declined steadily until the mid-2000s, as production outstripped the rate at which new discoveries, technological innovations and market conditions made additional deposits available. Since then, however, a number of new shale gas deposits and other plays in BC have become marketable and gas reserves in the West are once again rising.

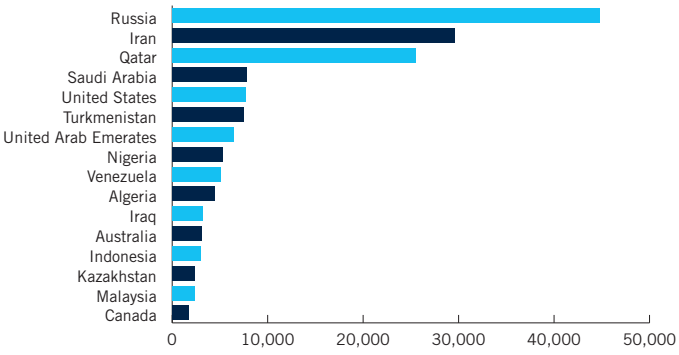
Unlike crude oil, Canada is not a major player when it comes to natural gas reserves on a global scale. Although significant unconventional deposits are known to exist in the West, Canadian marketable reserves are just a fraction of those in countries like Russia, Iran and Qatar.

10.8
YEARS

HOW LONG IT WILL TAKE TO DEPLETE CURRENT PROVEN RESERVES OF NATURAL GAS IN CANADA AT CURRENT RATES OF PRODUCTION

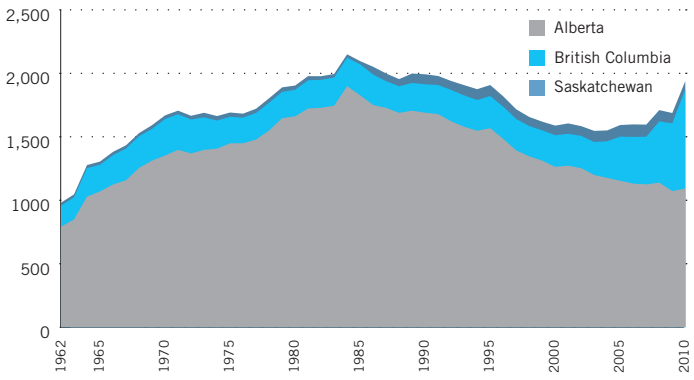
Source: BP.

Proven Natural Gas Reserves 2010
(billions of cubic metres)



Note: Proven reserves are those quantities of natural gas, which, by analysis of geological and engineering data, can be estimated with a high degree of confidence to be commercially recoverable from a given date forward, from known reservoirs and under current economic conditions.
Source: CIA World Factbook.

Marketable Natural Gas Reserves in Western Canada (billions of cubic metres)



Note: Reserve estimates for 2010 reflect a change in data collection methodology and are not strictly comparable to previous years' estimates.
Source: CAPP Statistical Handbook 2011.

Natural Gas

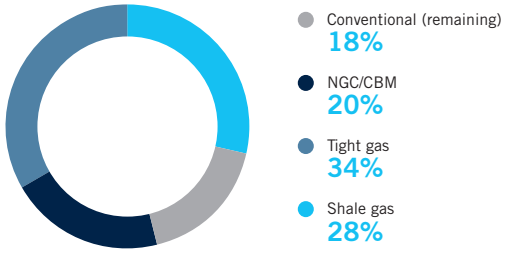
UNCONVENTIONAL SOURCES

While conventional gas production in western Canada is falling, there remains considerable untapped potential in the region's unconventional gas deposits. The development of new extraction techniques and technologies such as horizontal drilling and hydraulic fracking has made these deposits more accessible and could signal a new era for gas production in western Canada.

Estimates suggest that when shale, tight gas and coalbed methane deposits are added to conventional reserves, there could be as much as 111 trillion cubic metres of gas in place in western Canada. Although most of this gas is in Alberta, British Columbia has major shale reserves. While it is likely that only a portion of unconventional gas will be economically recoverable, these deposits hold considerable potential for western Canada.

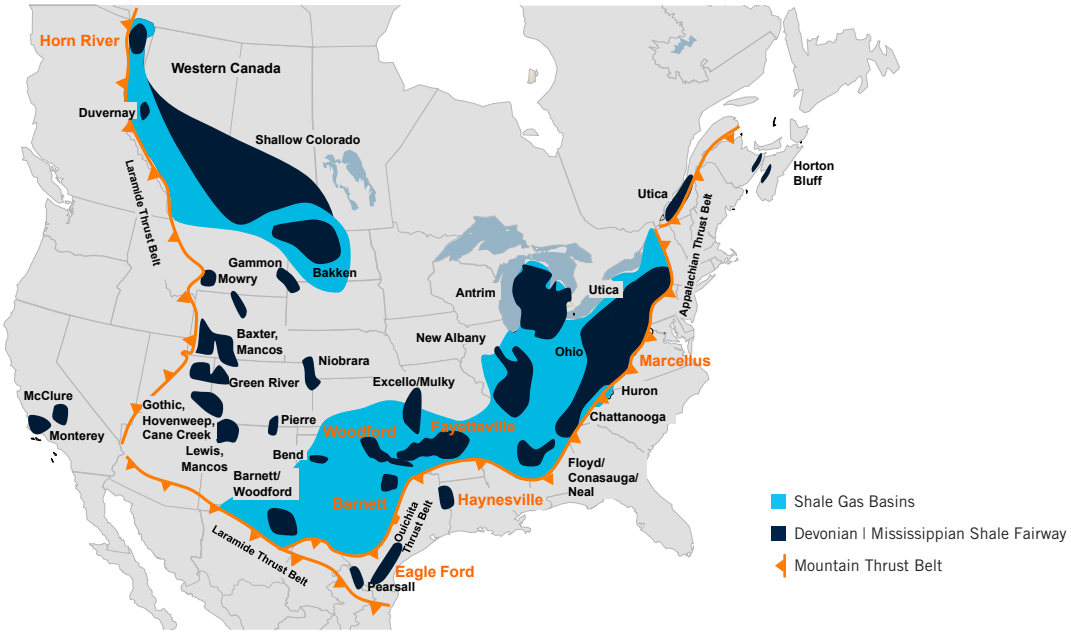
The challenge for the western provinces is the fact that the US – Canada's largest market for natural gas – is experiencing a shale gas boom of its own. An increase in domestic supply could reduce US demand for Canadian natural gas and slow the development of those resources in the West.

Natural Gas in Place in Western Canada



Note: Gas in place refers to the estimated content of known reservoirs and may not be technically or economically recoverable at the present time.
NGC = natural gas in coal. CBM = coalbed methane.
Source: Estimates from Petrel Robertson Resource Assessment Study completed for the Canadian Society for Unconventional Resources April 2010.

Unconventional Natural Gas Basins



Source: Used with permission from Ziff Energy.

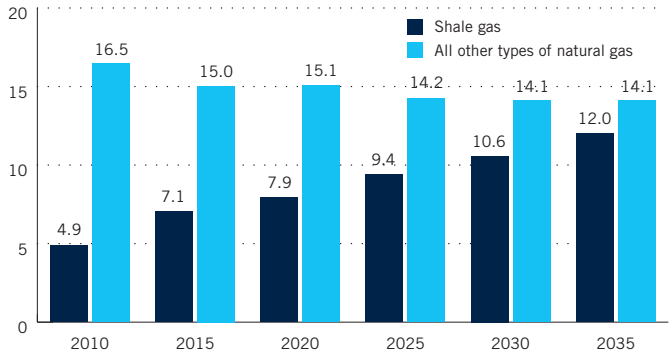
Natural Gas

PRICES & PRODUCTION OUTLOOK

Gas prices in western Canada reached an all-time annual high of US$7.99 per million Btu in 2008, a more than five-fold increase compared to ten years earlier. However, prices fell precipitously in 2009, to US$3.38 per million Btu—its lowest annual level since 2002—and have remained low since.

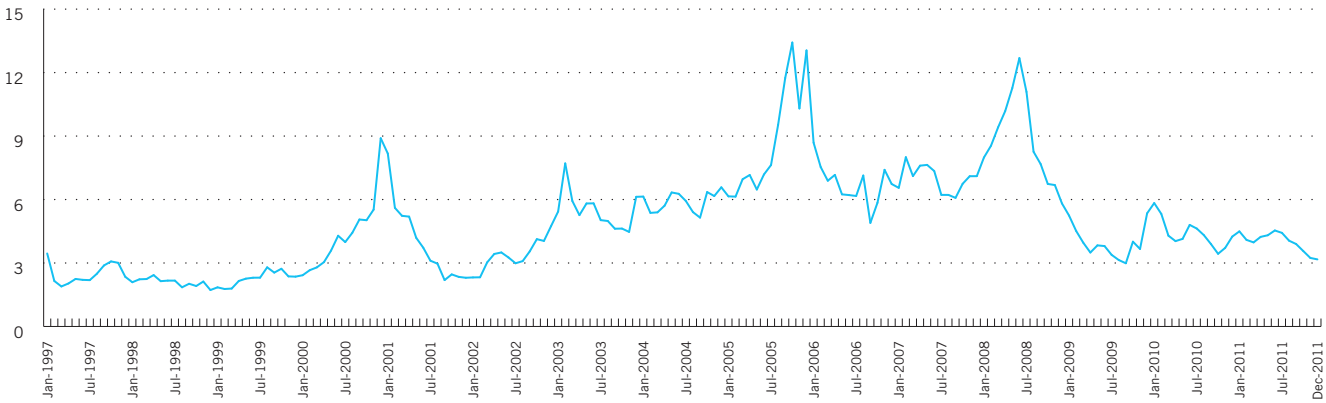
Natural gas prices are an important factor in the development of western Canada's unconventional gas deposits. Unconventional gas is relatively expensive to extract, meaning that higher prices are required for potential projects to reach their breakeven point. In addition, unconventional gas is not unique to western Canada; there are large deposits in the US and elsewhere around the world. If abundant supply keeps natural gas prices low, it will be more difficult to develop unconventional deposits in western Canada.

Natural Gas Production in the United States – Actual and Projected (trillion cubic feet)



Source: US Energy Information Administration *Annual Energy Outlook 2011*.

Natural Gas Prices (Henry Hub Spot Price) (US$/million Btu)



Source: US Energy Information Administration.

Natural Gas Liquids

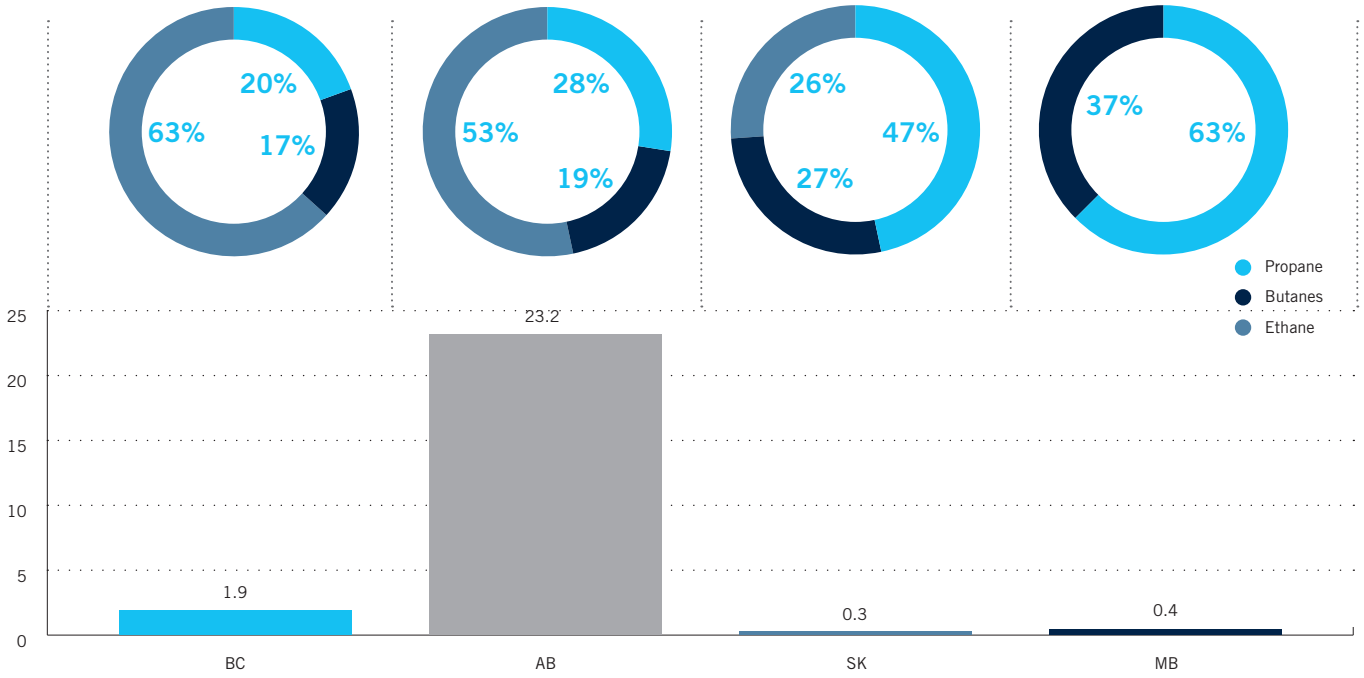
PRODUCTION

Raw natural gas contains a range of gaseous hydrocarbons, the heavier of which—gasses such as ethane, propane, butane and pentanes—are processed and refined into natural gas liquids (NGLs). In addition, some quantities of NGLs are recovered from crude oil production and bitumen upgrading. The western provinces account for nearly all (98.4%) of the 25.8 million cubic metres of NGLs produced in Canada in 2010. Because Alberta is the dominant source of natural gas in western Canada, it is also the largest source of NGLs. Alberta produced 23.2 million cubic metres of NGLs in 2010, 91.3% of total western Canadian production that year. Small quantities are produced in BC and Saskatchewan.

Ethane is the backbone of the NGL industry, accounting for 53.7% of NGL production in western Canada in 2009. At 27.3% of total NGL production, propane is the next largest type of NGL produced in the West. Butanes accounted for the remaining 19.0% of western Canadian NGL output in 2010.

As natural gas production declines in western Canada, NGL production is following suit. For each of the three types of gasses listed above, production in 2010 was well below peak output levels. In particular, propane production in 2010 was 28.7% below its 1996 peak, while ethane production was 15.6% below its 2006 peak.

Production of Natural Gas Liquids in Canada 2010 (millions of cubic metres)



Source: CAPP Statistical Handbook 2011.

Natural Gas Liquids

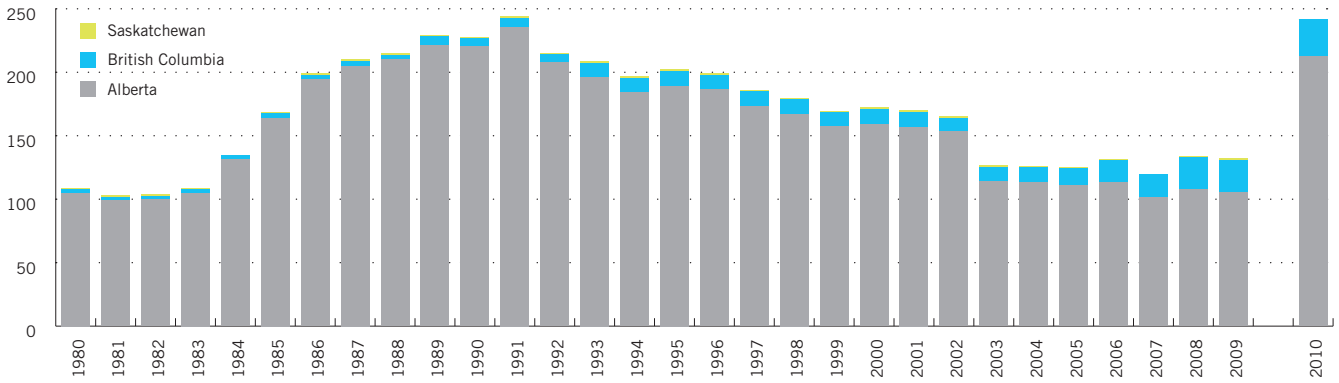
RESERVES

Given that the vast majority of marketable natural gas reserves in western Canada are found in Alberta, it is unsurprising that the province is also home to most of western Canada's NGL reserves. In 2010, about 88% of total NGL reserves were found in that province. Most of the remainder were in BC.

The higher level of NGL reserves in Alberta in 2010 compared to the year before is not the result of new discoveries or advances in recovery technologies, but simply a methodological change in how reserves are measured.

Reserves of natural gas liquids are in a long-term decline in western Canada. This decline is the direct result of the depletion of conventional natural gas reserves in Alberta. Reserves in Alberta have dropped by almost half over a twenty year period. Reserves in BC have risen over that same period, as the province has begun to develop its unconventional natural gas fields. However, the increase has not been sufficient to offset the decline in Alberta.

NGL/Ethane, Propane, Butane Reserves in Western Canada (millions of cubic metres)



Note: Reserve estimates for 2010 reflect a change in data collection methodology and are not strictly comparable to previous years' estimates.
Source: CAPP Statistical Handbook 2011.

Natural Gas Liquids

PRODUCTION OUTLOOK

NGLs play an important role in other industries in western Canada. Ethane is a primary feedstock in the region's petrochemical industry, and pentanes plus are used as diluents to enable the transportation of bituminous crude oil.

Western Canada could face an imbalance in NGL supply and demand in the years ahead. While unconventional gas deposits such as shale, tight gas and coalbed methane offer considerable potential to the natural gas industry, NGLs are less common in those deposits compared to conventional natural gas reserves.

Some capacity exists to produce ethane and other NGLs from the "off-gas" that is a by-product of oil sands upgrading. However, at present, the majority of the off-gases produced from oil sands upgraders are being used as fuel for oil sands operations.[4]

[4] www.ercb.ca/docs/documents/decisions/2009/2009-009.pdf

Actual and Projected NGL Production in Western Canada – 2010 and 2035

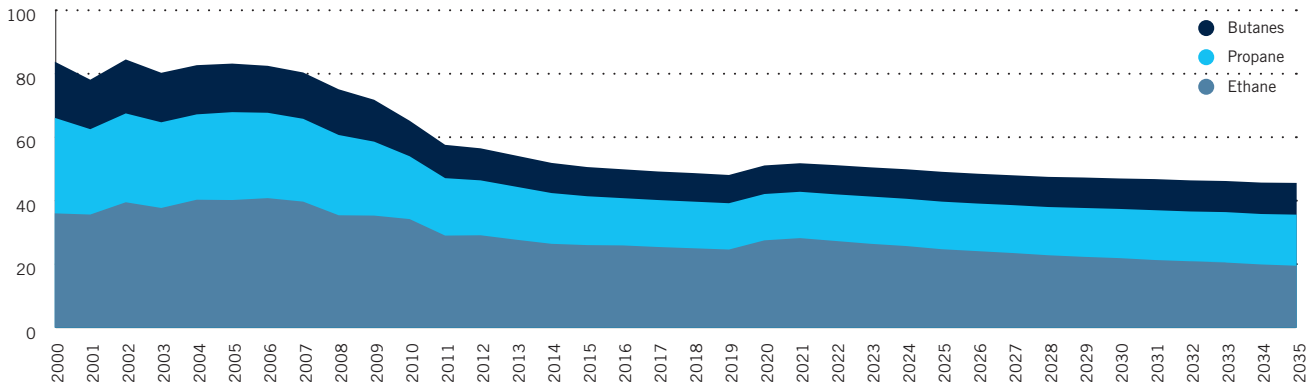
	Ethane		Propane		Butane	
	2010	2035	2010	2035	2010	2035
British Columbia	2.4	3.9	0.7	3.6	0.7	3.3
Alberta	31.7	15.5	18.5	12.2	10.1	6.5
Saskatchewan	0.1	0.1	0.6	0.3	0.4	0.2
TOTAL	**34.2**	**19.5**	**19.8**	**16.1**	**11.2**	**10.0**

Source: National Energy Board *Canada's Energy Future: Energy Supply and Demand Projections to 2035* (November 2011) reference case scenario.

30.1%

PROJECTED DECREASE IN WESTERN CANADIAN NGL PRODUCTION BY 2035 COMPARED TO 2010

Outlook for NGL Production in Western Canada (000 cubic metres per day)



Source: National Energy Board *Canada's Energy Future: Energy Supply and Demand Projections to 2035* (November 2011) reference case scenario.

Coal

PRODUCTION

Although much maligned for its high greenhouse gas intensity, coal is a cheap and efficient form of energy and an abundant resource worldwide. It is the world's single largest source of electricity and is used in nearly 70% of global steel production.[5]

In 2010, all the coal produced in Canada came from the western provinces – specifically, Alberta, BC and Saskatchewan. In total, the region produced 67,896 kilotonnes of coal in 2010. Alberta is the largest coal producer, extracting 31,591 kilotonnes in 2010 (46.5% of national production). BC is the country's next largest producer, at 26,040 kilotonnes (38.4%), followed by Saskatchewan at 10,264 kilotonnes (15.1%).

Most production in Alberta, and all production in Saskatchewan, is thermal coal – used primarily in electricity generation. By contrast, most BC coal is of a metallurgical variety (also known as hard coking coal) used in steel-making. Because of BC production, Canada is the world's second largest supplier of metallurgical coal.

[5] www.energy.alberta.ca/OurBusiness/coal.asp

Coal Production 2010

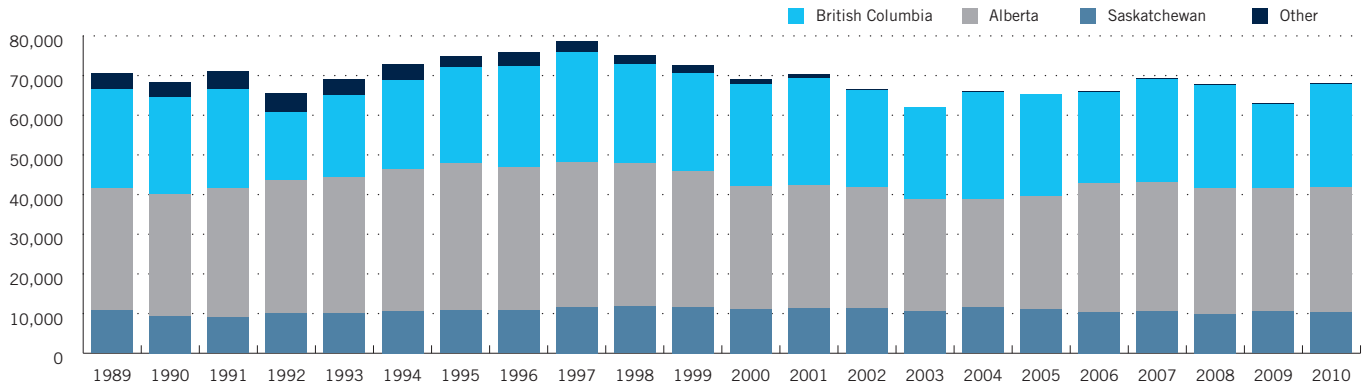
	kilotonnes	% of total
British Columbia	26,040	38.35
Alberta	31,591	46.53
Saskatchewan	10,264	15.12
Canada	67,896	100

Source: Statistics Canada Table 135-0002.

96%

OF COAL PRODUCED IN BC IS A HIGH-QUALITY METALLURGICAL VARIETY

Coal Production in Canada (kilotonnes)



Source: Statistics Canada *Energy Statistics Handbook*.

Coal

RESERVES

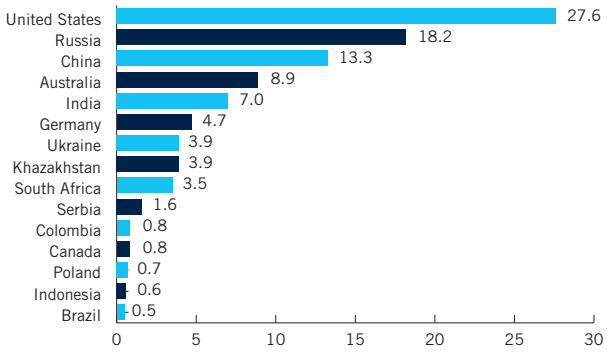
Coal is plentiful in western Canada and around the world. Canada has an estimated 4.3 billion tonnes of recoverable coal reserves, almost all of which is in the three westernmost provinces. However, these reserves are just a fraction of the geological resource in Canada. According to Natural Resources Canada, estimates of coal-in-place put the size of the actual resource at closer to 190 billion tonnes.[6]

Coal reserves vary by province both in terms of quantity and type. Across Canada, high-carbon anthracite and bituminous coal account for about 2.3 billion tonnes of marketable reserves. These reserves are located largely in BC and, to a lesser extent, in Alberta. The remaining 2.0 billion tonnes of marketable reserves are lower-carbon sub-bituminous and lignite varieties of coal. These are mostly found in Saskatchewan and Alberta.

Although western Canada has enough coal to meet national consumption requirements for generations, it is a small player on the international stage. BC is an important global supplier of metallurgical coal, but total coal deposits across Canada are just a small fraction of the available global supply; Canada has less than 1% of global coal reserves.

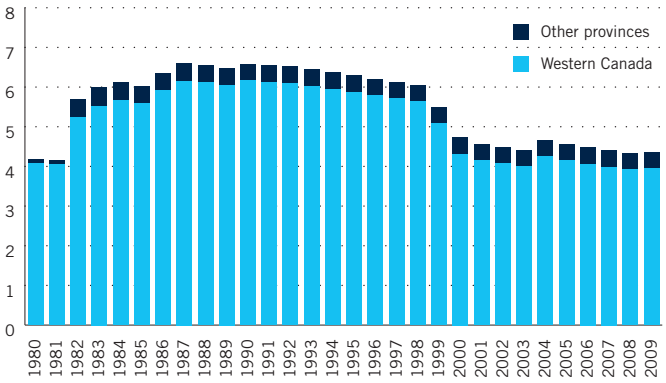
[6] www.nrcan.gc.ca/eneene/sources/coacha-eng.php

Proved Recoverable Coal Reserves
(share of world total – %)



Source: BP *Statistical Review of World Energy, 2011.*

Recoverable Coal Reserves in Canada
(billions of tonnes)



Source: Statistics Canada Tables 153-0017 and 153-0018.

Coal

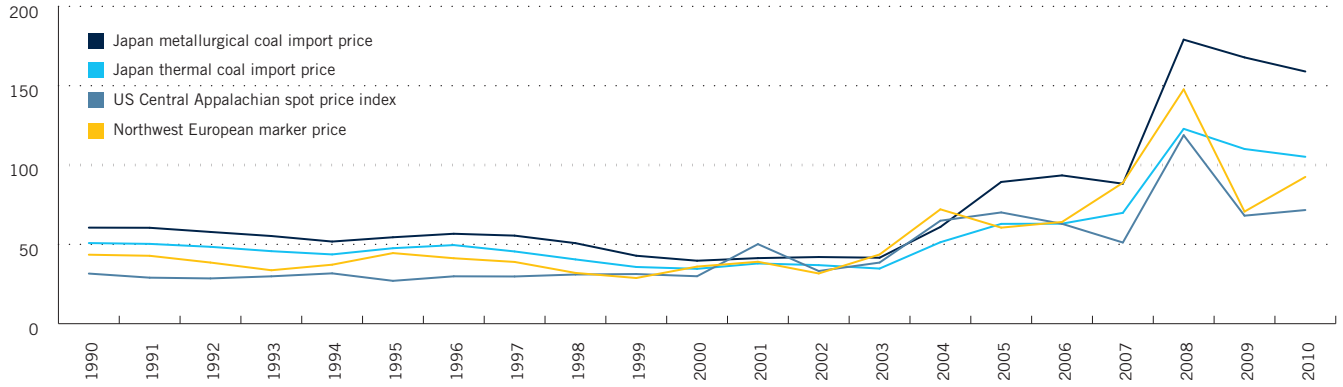
PRICES & PRODUCTION OUTLOOK

While coal remains an abundant and relatively inexpensive source of energy, growing concerns about the carbon emissions of coal-fired electricity generation have contributed to relatively flat demand for coal in many parts of the world. In the long-term, the future of thermal coal production may be tied to the development and implementation of new technologies to lower the emissions of coal-fired electricity generation.

Nevertheless, the outlook for coal production in western Canada is strong, largely due to soaring demand in Asia which, in turn, has contributed to strong growth in coal prices in that part of the world in recent years. Since the mid-2000s, coal prices have risen considerably, more than offsetting a prolonged period of weakness.

Demand has been particularly strong for metallurgical coal to feed steel production in China and elsewhere in the region. As a result, a large gap has opened between prices for metallurgical and thermal coal which had typically moved in parallel fashion. As a major global source of metallurgical coal, western Canada could benefit considerably from this boom in coal demand and prices.

World Coal Prices ($US/tonne)



Sources: BP *Statistical Review of World Energy, 2011.*

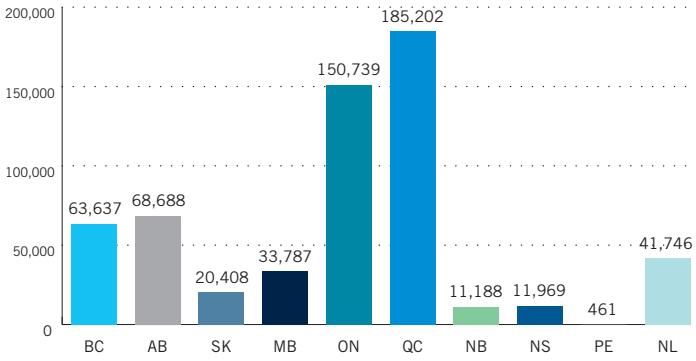
Electricity

GENERATION

Electricity generation varies considerably across Canada, reflecting differences in population, industrial activity and the extent to which provinces generate electricity for the export market. Electricity production is the one major form of energy not dominated by the western provinces. Quebec and Ontario are by far the largest overall producers together accounting for 57.0% of total electricity generated in Canada in 2010. About 31.7% of total electric power was generated in the four western provinces, and the remainder in Atlantic Canada.

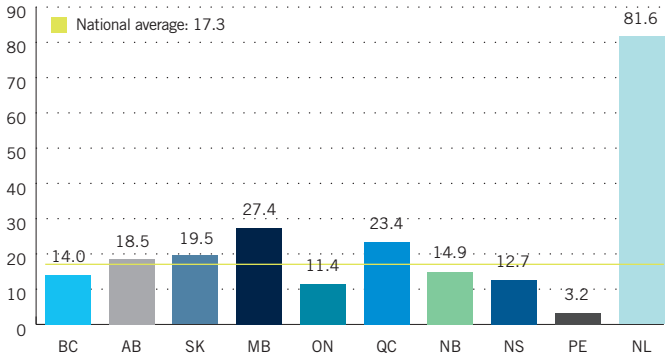
While Alberta and BC are the largest overall producers of electricity in western Canada, Manitoba is one of the largest producers in Canada on a per capita basis, second only to Newfoundland and Labrador.

Total Electricity Generation by Province 2010 (gigawatt hour)



Source: Statistics Canada Table 127-0007.

Per Capita Electricity Generation by Province 2010 (megawatt hour/person)



Source: Canada West Foundation calculations using Statistics Canada Tables 127-0007 and 51-0001.

Electricity

GENERATION BY TYPE

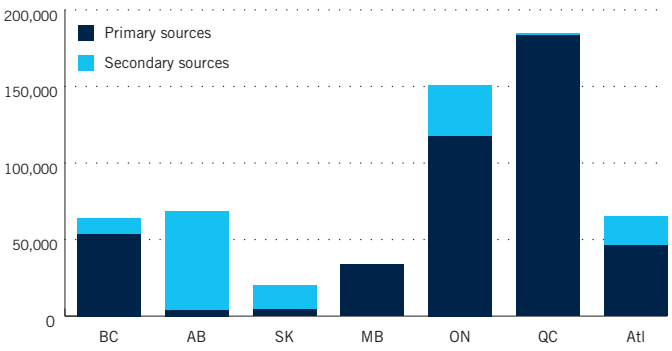
There are considerable differences across Canada in terms of the fuel stock used to generate electricity. For Canada as a whole, primary electricity (hydro, nuclear, wind, tidal and solar) accounts for the vast majority of total electric power generation. About 75.3% of total generation in 2010 was from primary sources. The remaining 24.7% was secondary electricity—that generated by burning other fuels. Coal is by far the largest secondary electricity fuel stock in Canada, accounting for 13.1% of total electricity production in 2010.

The western provinces can be separated into two groups based on the means used to generate electricity: those that primarily rely on hydroelectricity and those that primarily rely upon mineral resources.

British Columbia and Manitoba fall into the former category. Manitoba produces hydro power almost exclusively and 84.2% of BC's electricity production is generated from hydro power.

At the other end of the spectrum, Alberta generates electricity almost exclusively through burning fossil fuels, especially coal (although Alberta is by far western Canada's largest producer of wind energy). Saskatchewan also relies heavily on fossil fuel sources, although 18.9% of the province's electricity came from hydro power in 2010.

Electricity Generation by Type 2010 (GWh)



Source: Canada West Foundation calculations using Statistics Canada Tables 127-0007 and 128-0014.

ALBERTA ACCOUNTS FOR

54.6%

OF ALL COAL-FIRED ELECTRICITY GENERATION IN CANADA

Electricity Generation by Source 2010

	PRIMARY SOURCES					SECONDARY SOURCES				
	Hydro	Wind	Tidal	Solar	Nuclear	Coal	Natural Gas	Diesel and Fuel Oil	Others	TOTAL
British Columbia	53,555	123	–	–	–	–	3,401	141	6,418	63,637
Alberta	1,830	2,096	–	0	–	42,315	18,244	1,289	2,914	68,688
Saskatchewan	3,866	507	–	–	–	12,577	3,440	19	–	20,409
Manitoba	33,269	343	–	–	–	44	23	78	30	33,787
Ontario	32,553	3,073	–	156	81,975	13,433	17,981	247	1,322	150,739
Quebec	177,788	1,903	–	–	3,552	–	232	566	1,161	185,202
New Brunswick	3,325	389	–	–	0	2,290	2,035	2,565	585	11,188
Nova Scotia	1,007	387	28	–	–	6,792	2,278	1,100	378	11,969
Prince Edward Island	–	458	–	–	–	–	–	1	2	461
Newfoundland & Labrador	40,282	183	–	–	–	–	282	999	–	41,746
Territories	634	0	–	–	–	–	37	536	–	1,207
Canada	348,110	9,461	28	156	85,527	77,450	47,952	7,539	12,810	589,032

Note: Other secondary sources include wood and pulping liquor, manufactured gasses and other petroleum products.
Source: Statistics Canada Tables 127-0007 and 128-0014.

Electricity

HYDRO POTENTIAL

Hydroelectricity is the single largest source of electricity in Canada, accounting for 59.0% of all electrical energy produced in the country in 2010. More than half of all hydro power in Canada is generated in Quebec. BC is the next largest producer, accounting for 15.4% of Canadian hydro production in 2010.

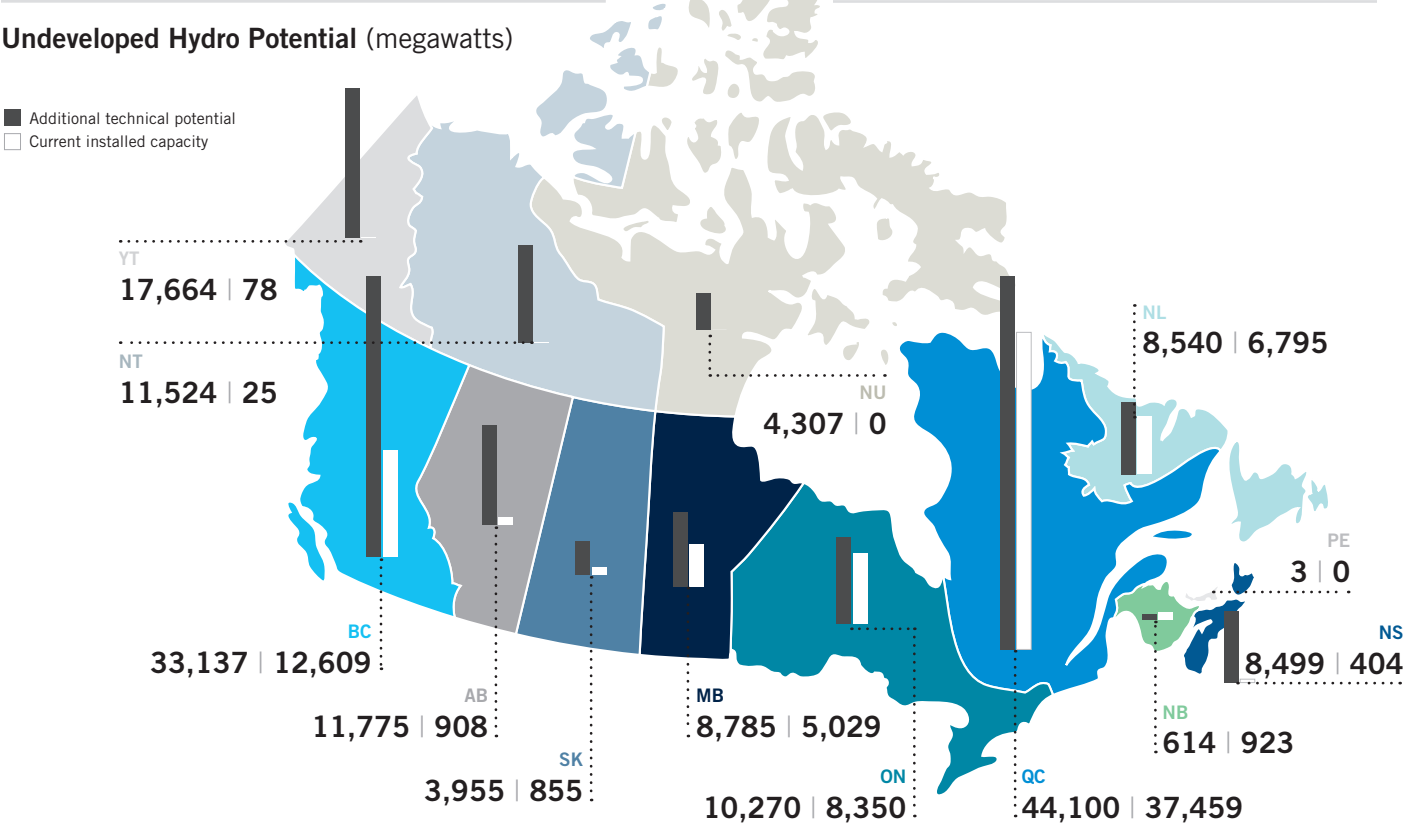
Canada has significant untapped hydroelectric potential. Even though Canada is already a major producer of hydro power, for every megawatt of installed national capacity, there are an estimated two additional megawatts of untapped potential capacity.[7]

Already the largest producer of hydro power, Quebec also has the largest potential for increasing generating capacity. However, much of Canada's untapped potential is found in western Canada and the northern territories. Indeed, BC nearly rivals Quebec in terms of hydro potential.

Manitoba leads western Canada in terms of developed hydro potential. Its current hydroelectricity production represented 36.4% of its total potential (installed capacity plus untapped technical potential) in 2008. British Columbia has developed 27.6% of its potential and Saskatchewan has developed 17.8%. Alberta lags all provinces except Nova Scotia and PEI, having developed just 7.2% of its hydro potential.

[7] Canadian hydropower association, *Hydropower in Canada: Past, Present and Future.* www.canhydropower.org/hydro_e/pdf/hydropower_past_present_future_en.pdf

Undeveloped Hydro Potential (megawatts)



Note: These estimates of technical potential are based on data obtained from various utility companies, associations and government reports. They refer to capacity that can technically be developed. Feasibility factors, such as economic or social aspects were not considered in this assessment. Further assessment must be conducted to confirm exact numbers.
Source: Canadian Hydropower Association, 2008.

Electricity

WIND & TIDAL POWER

The role of alternative sources of electrical generation has gained a higher profile in recent years with increasing awareness of the potential consequences of greenhouse gas emissions leading to a push toward lower-emission energy sources. Led by wind power, these sources make up a small but growing share of overall electricity generation in Canada. The Canadian Wind Energy Association notes that wind energy capacity in Canada increased from 444 MW in 2004 to 5,265 MW at the end of 2011, nearly a 12-fold increase in seven years.

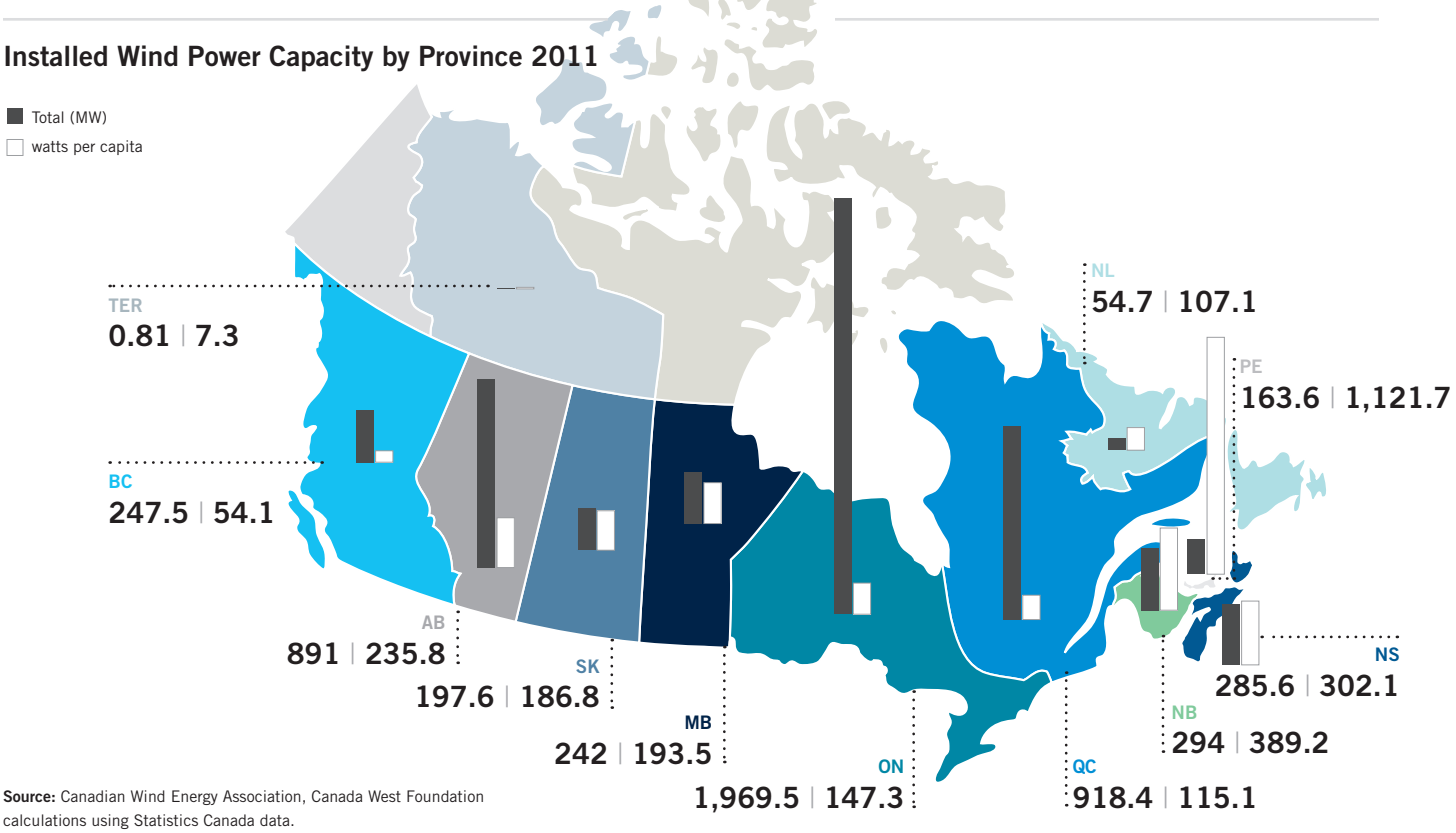
Western provinces are among the leaders in developing wind resources. At 891 MW in 2011, Alberta has the third largest installed capacity for wind-powered electricity in Canada, behind Ontario and Quebec. On a per capita basis, Alberta and Saskatchewan have more installed wind generation capacity than anywhere else in Canada, with the exception of the Maritime provinces, which dwarf all others.

Although modest to date, BC is expected to greatly increase its capacity to generate electricity through wind and tidal energy. Wind capacity has more than doubled since 2010 and several additional projects are proposed or in development. In addition, a tidal energy pilot project is being explored for the west coast of Vancouver Island.

Although western Canada already accounts for close to one third of Canada's current installed capacity for wind-generated electricity, the potential exists for the region to expand significantly on that record. In particular, the southern portions of the three prairie provinces are home to some of the highest on-land average wind speeds in Canada, with the notable exceptions of Newfoundland and Labrador and northern Quebec.

However, the highest average wind speeds in Canada exist over open water: on the Atlantic and Pacific Oceans, the Great Lakes and Hudson's Bay. Strong coastal winds help to create favourable conditions for offshore wind generation off the coast of BC, and potentially in northern Manitoba.

Installed Wind Power Capacity by Province 2011



Source: Canadian Wind Energy Association, Canada West Foundation calculations using Statistics Canada data.

Electricity

ADDING CAPACITY: COSTS & BENEFITS BY TYPE

As Canada grows, demand for electricity is expected to continue to rise. Meeting this new demand, as well as replacing older facilities that are reaching the end of their lifespan, will require investment in new generating capacity. However, each of the different types of power generation facilities offers a range of benefits and drawbacks related to up-front capital costs, operating costs, greenhouse gas emissions, and capacity factors (actual output versus potential output).

Wind and solar power are attractive from an emissions standpoint and have no fuel costs, but suffer from high installation costs and low capacity factors, making them, for the present at least, unreliable as a base load for an electrical system.

By contrast, coal and natural gas are more reliable – they are characterized by high capacity rates and moderate capital requirements – but suffer from fuel costs subject to market pressures and potentially onerous obligations to reduce greenhouse gas emissions.

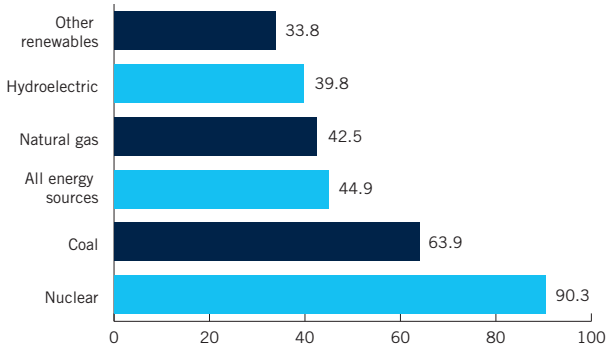
Conversely, hydro and nuclear generation – while initially expensive to build – have very low ongoing costs and do not emit greenhouse gases. However, each has environmental concerns beyond emissions – hydroelectric generation can alter river flows and cause great damage to local ecosystems, while nuclear power plants face the hurdle of toxic waste disposal.

Estimates of Power Plant Capital and Operating Costs

	Capital costs (US$/kWh)	Fixed O&M costs (US$/kWh)	Variable O&M costs (US$/MWh)
Coal			
Dual unit pulverized coal	2,844	29.67	4.25
Dual unit integrated gasification combined cycle (IGCC)	3,221	48.9	6.87
Natural gas			
Conventional combined cycle	978	14.39	3.43
Advanced combined cycle	1,003	14.62	3.11
Conventional Combustion turbine	974	6.98	14.7
Advanced combustion turbine	665	6.7	9.87
Uranium			
Dual unit nuclear	5,335	88.75	2.04
Biomass			
biomass combined cycle	7,894	338.79	16.64
biomass bubbling fluidized bed (BFB)	3,860	100.5	5
Wind			
Onshore wind	2,438	28.07	0
Offshore wind	5,975	53.33	0
Solar			
Solar Thermal	4,692	28.07	0
Small photovoltaic	6,050	26.04	0
Large photovoltaic	4,755	16.7	0
Geothermal			
Dual flash	5,578	84.27	9.64
Binary	4,141	84.27	9.64
Municipal Solid Waste			
MSW	8,232	373.76	8.33
Hydro			
Hydro-electric	3,076	13.44	0
Pumped storage	5,595	13.03	0

Note: "dual unit" reflects the savings associated with operating more than one unit on a given site.
Source: US Energy Information Administration www.eia.gov/oiaf/beck_plantcosts/pdf/updatedplantcosts.pdf.

Average Capacity Factor of Electricity Generation by Power Source 2009



Note: Natural gas refers to combined cycle plants. Average capacity factor refers to actual generation as a percentage of maximum potential output.
Source: US Energy Information Administration, Form EIA-860, "Annual Electric Generator Report;" Form EIA-923, Power Plant Operations Report," and predecessor forms.

Uranium

PRODUCTION & RESERVES

Saskatchewan is home to some of the highest grade uranium deposits in the world and is one of the largest global producers of the mineral. Total production in 2010 reached 9,783 tonnes, making Saskatchewan the second largest source of uranium in the world, behind only Kazakhstan. Saskatchewan also has the third largest recoverable reserves of uranium in the world. At 9.0% of global reserves, Saskatchewan sits behind only Australia and Kazakhstan. Moreover, the quality of uranium deposits in Saskatchewan give producers operating in that province an advantage over those in other parts of the world.

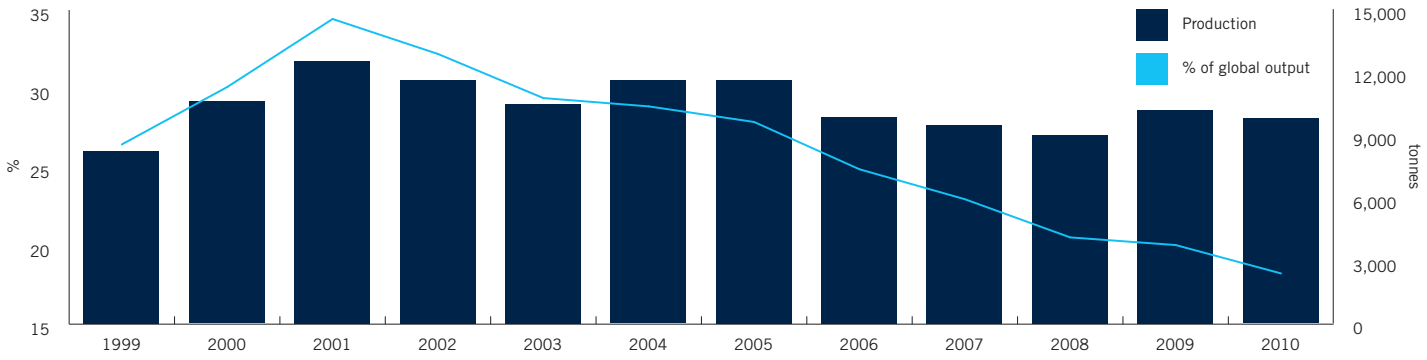
As uranium production rises in other parts of the world, Saskatchewan is falling in significance as a global supplier. In 2001, Saskatchewan accounted for 34.4% of world uranium production, but that share fell to 18.2% by 2010. However, several new prospective mines are under development in Saskatchewan, notably the Cigar Lake project, which will help boost production levels in the province.

Uranium Production and Reserves 2010

	production		reserves	
	(tonnes)	% of total	(000s of tonnes)	% of total
Kazakhstan	17,803	33.2	651	12.0
Canada	9,783	18.2	485	9.0
Australia	5,900	11.0	1,673	31.0
Namibia	4,496	8.4	284	5.3
Niger	4,198	7.8	272	5.0
Russia	3,562	6.6	480	8.9
Uzbekistan	2,400	4.5	111	2.1
United States	1,660	3.1	207	3.8
Ukraine	850	1.6	295	5.5
All others	3,011	5.6	946	17.5

Note: Uranium reserves figures are for 2009.
Source: World Nuclear Association.

Uranium Production in Saskatchewan



Source: World Nuclear Association.

Uranium

PRICES & PRODUCTION OUTLOOK

After years of relative price stability, uranium producers have had to operate in a price environment at least as volatile as that known to oil and gas producers. After more than 15 years of fluctuating in a range of about US$8 to US$17 a pound, uranium spot prices soared to a high of US$136 a pound in mid-2007 before falling below US$42 in early 2010. Prices began to recover late in 2010 and were expected to remain strong into the foreseeable future as planned construction of nuclear power plants in China and elsewhere were expected to keep uranium demand high.

The earthquake and subsequent nuclear disaster in Japan have added an element of uncertainty to this outlook. Uranium prices fell by 27.2% from January through June 2011 in anticipation of reduced global demand for nuclear power. If demand does falter and prices remain low, this could be bad news for uranium mining in Saskatchewan as low prices not only affect existing producers, but could deter additional exploration and development as well.

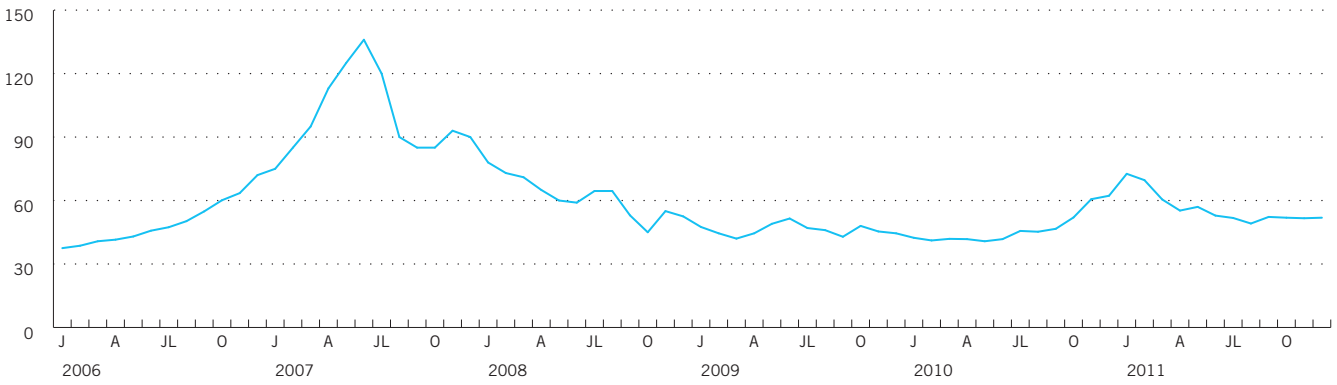
SASKATCHEWAN'S KNOWN URANIUM DEPOSITS WILL LAST

20-30

YEARS

Source: Saskatchewan Mining Association.

Uranium Spot Prices ($US per pound)



Source: Ux Consulting Company via www.cameco.com/marketing/uranium_prices_and_spot_price/spot_price_5yr_history/.

Conclusion

Risks and Opportunities

Energy production in western Canada is in the midst of a remarkable transformation. Conventional oil and natural gas production in the region have been falling as reserves in mature fields are slowly depleted. At the same time, the vast energy wealth in the oil sands is only just beginning to be developed and the potential in western Canada's unconventional natural gas deposits is, as yet, largely unrealized. In addition, the region's renewable energy sector continues to expand as investments proceed in new wind, tidal and hydroelectric projects.

As the nature of energy production in western Canada evolves, it brings with it a series of new opportunities and risks. For oil and gas producers, the opportunities are clear: there is tremendous productive potential in the oil sands and other unconventional oil and gas deposits. The challenge, however, is that many of these deposits require significant capital investments to proceed, and the cost of recovering the resources is often quite high relative to other sources of oil and gas around the world.

As always, expectations of future energy prices will play a critical role in determining the pace of development of western Canada's oil and gas industry in the years ahead. If the outlook for oil or gas prices falls, producers in the West will be among the first to be affected.

For its part, the renewable electricity sector in western Canada (with the exception of hydroelectricity) is very much in its infancy. Wind power is by far the most well-developed source of alternative energy in the region, but electrical output from that source remains just a small fraction of the total power generated through more conventional means such as hydroelectricity and the combustion of natural gas and coal. While renewable electricity is attractive because it is emissions-free and cannot be depleted, there are several challenges which must be overcome before it can play a more significant role in western Canada's energy mix.

One of these challenges is the relatively high cost of alternative energy production. The capital costs associated with wind turbines, solar panels or other facilities is much higher per unit of electricity produced than coal- or gas-fired plants. A second challenge for some alternative electricity sources is the fact that they are relatively unreliable and unable to increase output when demand spikes.

Although it faces many energy-related challenges, western Canada is in a fortunate position as the home to some of the largest oil reserves in the world, abundant natural gas deposits, a wealth of coal, significant untapped hydroelectric capacity, abundant arable land for ethanol and biodiesel production and alternative electricity options. This energy diversity is one of the region's greatest strengths.

However, to capitalize more fully on that strength requires closer cooperation in energy production and distribution across the West. Long-term policy goals such as reducing greenhouse gas emissions, increasing energy efficiencies in the region, or decreasing the cost of resource extraction are best accomplished in a cooperative environment and through greater coordination of energy policies across the region.

ECONOMIC IMPACT OF ENERGY PRODUCTION

13.6%
was the energy sector's share of total economic activity in western Canada in 2010

14.5%
of Saskatchewan's GDP in 2010 came from the energy sector

$2,218
is the average weekly wage of workers in the oil and gas extraction industry

Over 22% of provincial government revenues in Alberta in 2009-2010 came from royalty income

$23.5 billion
was the value of capital expenditures in oil and gas extraction in Alberta in 2010

$121.3 billion
was the value of foreign direct investment in fossil fuel extraction and refining in Canada in 2010

Introduction

The energy sector makes a significant contribution to economic prosperity in western Canada. The entire range of energy-related activities – from initial exploration and feasibility analyses of new energy projects through to the sale and delivery of final energy products – accounted for 13.6% of total economic output in western Canada in 2010.

However, the true impact of the energy sector runs far deeper into the regional economy. The sector contributed $55.8 billion to western Canadian GDP in 2010, but that total does not include the indirect and induced effects into other sectors of the western Canadian economy. Nor, for that matter, does it include the spillover effects into other provinces in central and Atlantic Canada.

Business services, engineering and design, construction, manufacturing and a host of other industries in the region also benefit from the presence of energy-related activities in western Canada. These effects are, unfortunately, not reflected in major economic indicators like employment and GDP. In addition, the profits and wages generated by energy sector activity also feed back into the economy through increased retail sales of goods and services.

Even without considering these indirect and induced effects, the impact of the energy sector in western Canada is significant. Energy projects – those in the oil and gas industry in particular – are magnets for capital investment from around the world. Oil and gas plays (the activities associated with petroleum development in an area – see oilgasglossary.com) in BC and Alberta alone have attracted billions of dollars of foreign direct investment from China, South Korea and Japan in recent years.

In addition, mining and energy activity employs more than 192,000 western Canadians and accounts for a growing share of overall employment in the region. Moreover, because energy production is a capital-intensive activity, these jobs tend to be more productive than jobs in other sectors (in terms of GDP created per hour of work) and as such, are relatively high-paying.

Finally, provincial governments in western Canada also benefit from the energy sector through tax revenues, as well as through resource royalties and Crown land sales and leases.

Direct Economic Impact

GROSS DOMESTIC PRODUCT

Energy production, distribution and other support activities are important drivers of economic activity in western Canada. For the region as a whole, the energy sector contributed $55.8 billion to GDP in 2010, equivalent to 13.6% of total economic output. The four western provinces accounted for two thirds of Canada's total energy sector GDP that year.

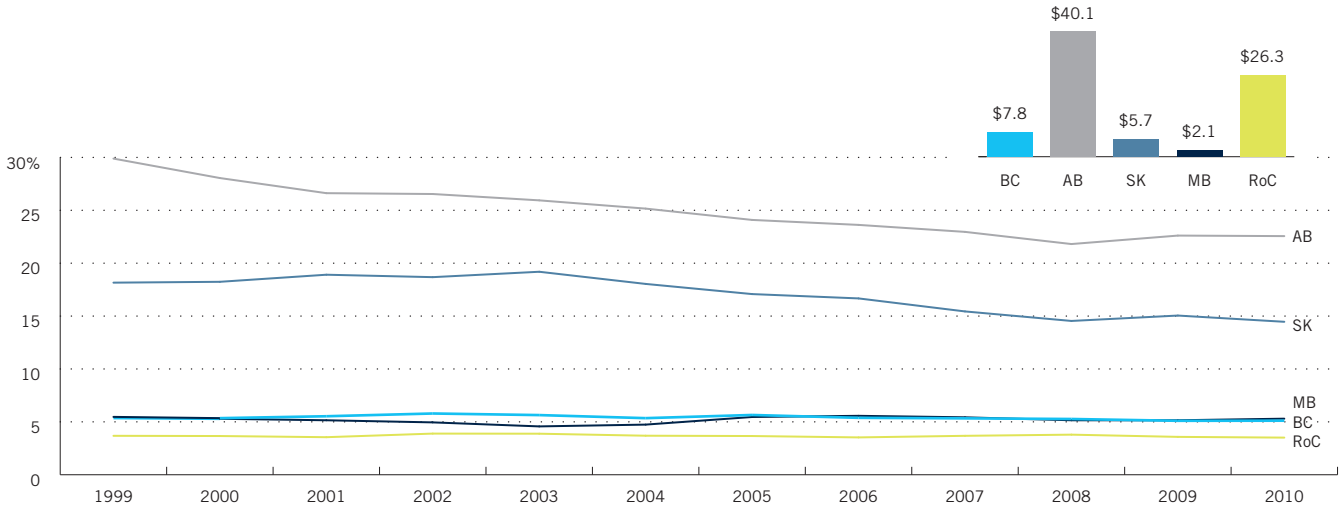
With the exception of Newfoundland and Labrador, where energy accounts for 24.0% of provincial GDP, nowhere in Canada is energy production more important to the economy than in Alberta. In 2010, the energy sector accounted for 22.6% of provincial GDP.

Within western Canada, BC is the second largest generator of wealth from energy production, with a total value of $7.8 billion in 2010, followed by Saskatchewan at $5.7 billion and Manitoba at $2.1 billion. However, in terms of the energy sector's importance to provincial economic output, Saskatchewan ranks well above BC and Manitoba. In Saskatchewan, the energy sector made up 14.5% of provincial GDP in 2010. The figures for Manitoba and BC were considerably lower, at 5.3% and 5.1%, respectively.

Although the energy sector continues to expand in all four provinces, its importance to economic activity in western Canada is falling. This trend is especially evident in Alberta and Saskatchewan as strong growth in other sectors has contributed to those provinces reducing their dependence on energy production as a driver of economic growth.

Importance of the Energy Sector in Western Canada
(energy sector GDP as a percentage of total GDP)

Energy Sector GDP 2010
($ billions)



Source: Canada West Foundation calculations using Statistics Canada Tables 379-0036 and 379-0025.

Direct Economic Impact

CAPITAL INVESTMENT

Energy production is capital-intensive. Compared to other industries, the production and distribution of oil, gas, electricity and other types of energy require significant investments in infrastructure, machinery and equipment just to get off the ground.

Oil and gas extraction alone is a major source of capital investment in western Canada, especially in Alberta. In 2010, capital expenditures in oil and gas extraction in Alberta were valued at $23.5 billion, accounting for 33.3% of all capital investment in the province that year. Because of the importance of the oil and gas sector to the Alberta economy, the province is the second-largest destination for capital investment in Canada, behind only Ontario.

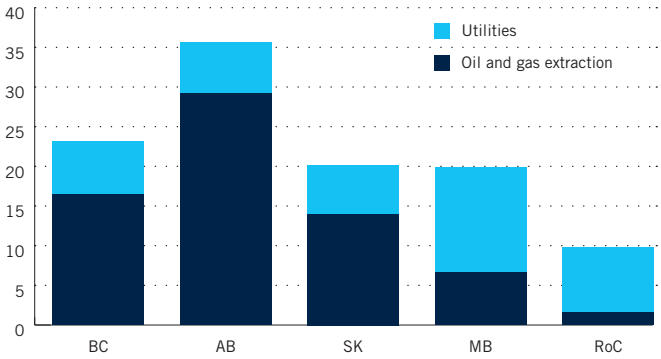
Oil and gas activities are also an important source of capital investment in BC, with total capital investments in the extractive sector of $7.7 billion in 2010, accounting for about 17.2% of all capital spending in the province that year. In Saskatchewan, capital spending on oil and gas activity was $2.6 billion—about 16.6% of all investment in the province.

Figures are not available on capital spending in oil and gas extraction in Manitoba, although total investment in that province in mining and oil and gas together was $707 million in 2010. Investment in utilities projects accounted for a significant share of capital spending in Manitoba that year.

35.6%

OF 2010 CAPITAL EXPENDITURES IN ALBERTA WERE IN THE ENERGY SECTOR

Energy-Related Capital Expenditures by Province 2010 (% of total provincial capital investment)



Notes:
1) Data are preliminary and subject to revision.
2) Data on capital spending in oil and gas extraction includes investments in mining for Manitoba.
3) Utilities investments include electrical power generation, transmission and distribution; natural gas distribution; and water, sewage, and other systems.
4) Except for Manitoba, data do not include capital spending on oil- and gas-related support activities.

Source: Canada West Foundation calculations using data from Statistics Canada *Public and Private Investment in Canada, Intentions 2011.*

Capital Expenditures by Industry in Western Canada ($ millions)

	Oil and gas extraction			Utilities		
	2009	2010p	2011e	2009	2010p	2011e
BC	4,449	7,667	6,629	3,283	3,011	3,249
AB	23,599	23,462	26,154	3,805	4,486	4,960
SK	2,969	2,624	3,144	803	972	1,575
MB	568	707	705	960	1,426	1,440
RoC	2,839	3,773	4,791	14,415	15,119	15,653

Notes:
1) Data are preliminary and subject to revision
2) Expenditures on support activities for mining, oil and gas are included in the oil and gas extraction figures.
3) For Manitoba, capital spending in oil and gas extraction also includes mining-related expenditures.
4) Utilities investments include electrical power generation, transmission and distribution; natural gas distribution; and water, sewage, and other systems.
5) p=preliminary e=estimate

Source: Statistics Canada, *Public and Private Investment in Canada, Intentions 2011.*

Direct Economic Impact

FOREIGN DIRECT INVESTMENT

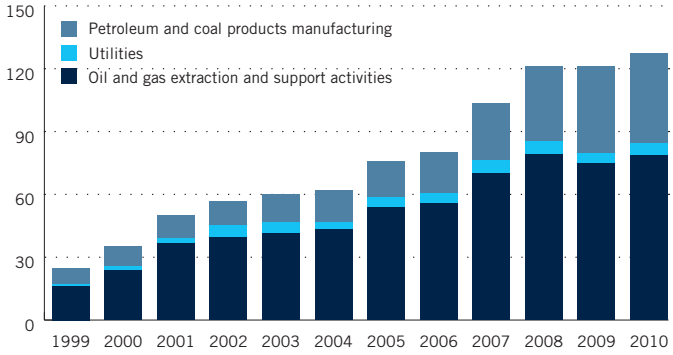
Canada is one of the few energy-rich jurisdictions in the world which is open to foreign direct investment (FDI). About 77% of oil reserves worldwide, for example, are owned and controlled by national governments; private companies have no access, or restricted access, to those deposits. Of the remaining 23% of oil reserves to which access is relatively open, more than half are found in Alberta's oil sands.

Canada's relative openness to FDI in energy, combined with the untapped potential in the oil sands, and in new oil and gas plays across western Canada, have made the region's energy sector a magnet for FDI from around the world. While provincial data on FDI are not available, national-level data indicate that FDI in fossil fuel extraction and refining in Canada reached $121.3 billion in 2010, a 270% increase from a decade earlier.[1] These investments accounted for 21.6% of all FDI in Canada in 2010.

With the exception of some offshore activity in Newfoundland and Labrador, it is reasonable to assume that most of this investment has been in western Canada. Indeed, anecdotal evidence suggests that most of this foreign investment is taking place in BC and in Alberta. In recent years, those provinces have attracted billions of dollars of new investments, mostly from Asian interests such as China, South Korea, Japan and Thailand.

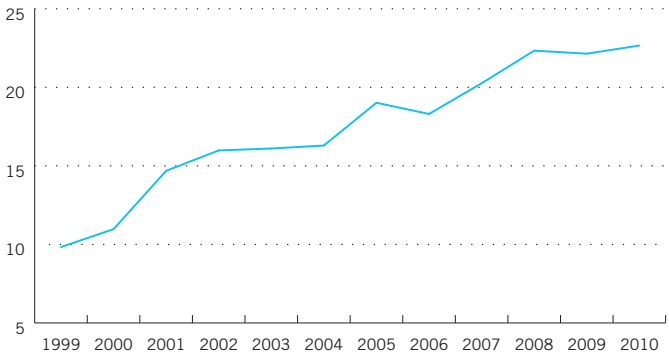
[1] This figure includes investments in oil and gas extraction; support services for mining, oil and gas activities; and petroleum and coal products manufacturing.

Foreign Direct Investment in Energy-Related Industries in Canada ($ billions)



Note: Data on FDI in utilities may overstate investments in energy-related activities because, in addition to electrical power generation, transmission and distribution, and natural gas distribution, utilities data also include FDI in irrigation sewage, and other water-related systems.
Source: Statistics Canada Table 376-0052.

Share of Total FDI in Canada – Energy-Based Industries (%)



Note: Includes foreign direct investment stocks in petroleum and coal products manufacturing; utilities; and oil and gas extraction and support activities.
Source: Statistics Canada Table 376-0052.

Direct Economic Impact

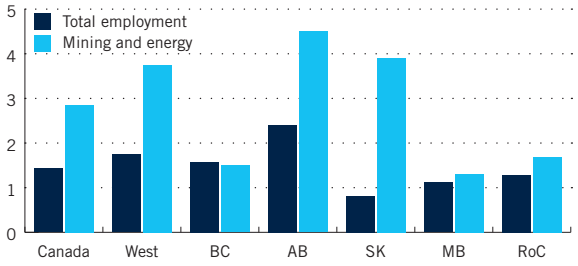
EMPLOYMENT

Limitations on data availability make it difficult to provide a complete picture of energy sector employment in western Canada. Not enough information is available to separate non-energy mining and utilities from the employment figures. As such, the figures presented here include all energy, mining and utilities employment. They do not, however, include data on jobs in petroleum and coal products manufacturing which are not available for most provinces.

In total, about 192,300 western Canadians were employed in the energy and mining sectors in 2010, accounting for about 3.5% of business sector jobs in the region. Not surprisingly, most of these jobs, 134,000, or about 69.7%, were in Alberta. BC had the second largest number of workers in energy and mining that year with about 26,200 jobs, followed by Saskatchewan and Manitoba.

As with their impact on GDP, energy and mining are considerably more important to provincial labour markets in Alberta and Saskatchewan than they are in BC and Manitoba. Of all Albertans with jobs, 6.4% worked directly in energy and mining in 2010, while in Saskatchewan, those sectors employed 4.0% of the province's workforce. By comparison, energy and mining employed just 1.9% of Manitobans and 1.1% of British Columbians that year.

Business Sector Employment Growth by Province 2000-2010 (%)



Source: Canada West Foundation calculations using Statistics Canada Table 383-0010.

Business Sector Employment in Mining and Energy in Western Canada

	Total employment (000s)		% of total business sector employment		Average growth
	2000	2010	2000	2010	(%/year)
BC	22.5	26.2	1.2	1.1	1.5
AB	86.6	134.0	5.3	6.4	4.5
SK	14.8	21.7	3.0	4.0	3.9
MB	9.2	10.5	1.9	1.9	1.3
West	133.1	192.3	2.9	3.5	3.7
RoC	112.1	132.5	1.1	1.1	1.7

Note: Includes employment in mining, oil and gas extraction, related support industries, utilities and pipeline transportation. Data on coal and petroleum product manufacturing are not available and therefore not included in this table.
Source: Canada West Foundation calculations using Statistics Canada Table 383-0010.

Energy-Related Employment in Western Canada 2010

	BC	AB	SK	MB
Oil & gas extraction	3,940	53,015	4,465	250
Coal mining	2,575	1,885	x	0
Support activities for mining, oil & gas	5,855	62,135	7,375	745
Electric power generation, transmission & distribution	8,095	7,500	2,210	5,290
Natural gas & water distribution	1,520	3,200	460	630
Pipeline transportation	1,350	5,005	570	100

Note: Data not available for all energy-related industries.
x=data suppressed to protect business confidentiality.
Source: Statistics Canada Table 383-0010.

Direct Economic Impact

WAGES & SALARIES

Although the energy sector is not labour intensive, it contains some of the highest-paid jobs in Canada. Average weekly earnings in energy-related industries are among the highest in the country and exceed the national average by a considerable margin. In particular, oil and gas extraction pays the highest average wages of any industry in Canada, at $2,218 per week (including overtime).

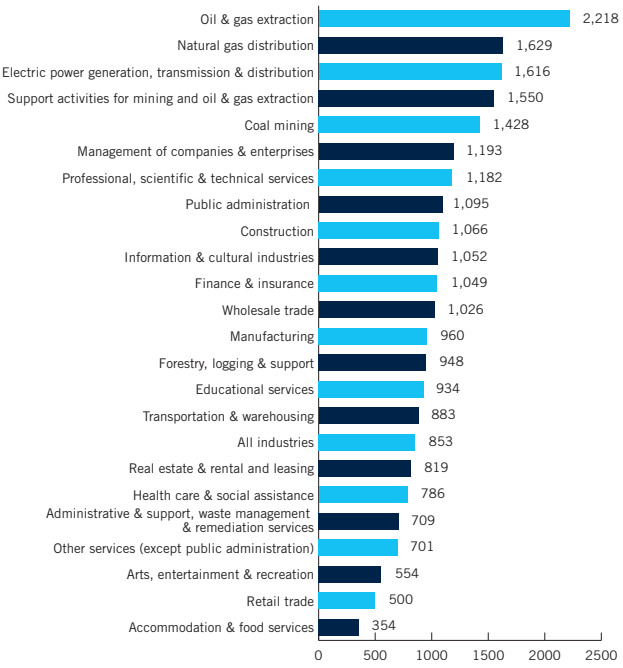
Lucrative wages in energy-related industries have helped to lift average earnings across the western provinces. In part because of the influence of high-paying jobs in energy-related fields, Alberta has by far the highest average weekly earnings of any province in Canada, at $993 per week in 2010, compared to $853 for Canada as a whole. Average earnings in the other three western provinces were below the national average in 2010, but would have been lower still in the absence of energy-related activity.

High wages from the energy sector offer a number of important benefits to the western Canadian economy. These include increased consumption and spillover effects into other industries and higher tax revenues for the provincial and federal governments.

160%

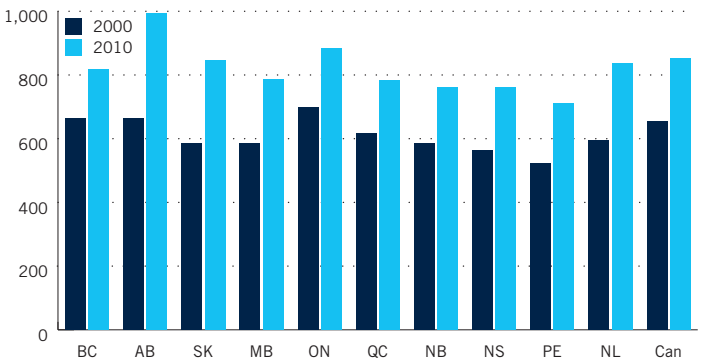
AMOUNT BY WHICH WAGES IN OIL AND GAS EXTRACTION EXCEED THE ALL-INDUSTRY AVERAGE

Average Weekly Earnings by Industry 2010 ($)



Note: Data on wages in coal mining is from 2007.

Average Weekly Earnings by Province ($)



Source: Statistics Canada Table 281-0027.

Government Royalties

OVERVIEW

One of the most important ways in which energy production benefits western Canada is through the revenues it generates for provincial governments. Resource royalties, corporate taxes and profits from energy production increase fiscal capacity in western Canada.

Royalties are a major source of provincial government income in western Canada, especially in Alberta and Saskatchewan. Fossil fuel royalties (including land leases/sales and other energy-specific revenue sources) added $7.9 billion to provincial government coffers in Alberta in 2009-2010 and $1.4 billion to those of Saskatchewan. Just over 22% of Alberta's total revenues that year came from royalty income, as did 13.4% of Saskatchewan's total provincial government revenues.

By comparison, royalties are not as large in BC, although with the development of the province's natural gas industry, provincial Crown land tenures have expanded considerably in recent years. Energy royalties made up 4.5% of government revenue in BC ($1.7 billion) in 2009-2010. In Manitoba, mineral resource income is small, representing just 0.3% of provincial government revenue in 2009-2010 ($27 million).

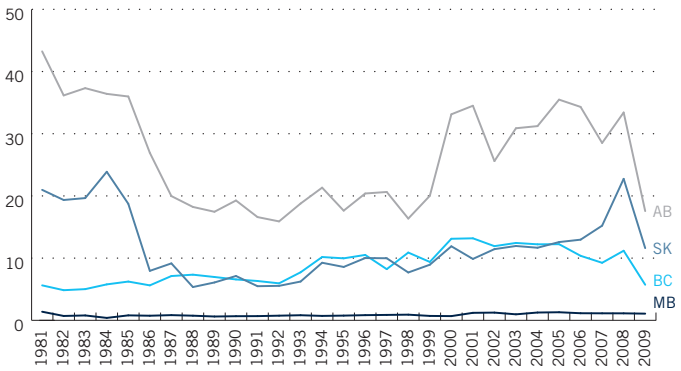
It should be noted that while the provinces have jurisdiction over energy resources on their territories, the federal government owns oil and gas rights on "frontier lands," including in territorial seas and the continental shelf. Although production levels are small, the federal government does collect some royalty revenue from those developments. In 2010, federal royalties totalled $15.7 million. The federal government also collects corporate and personal income taxes, as well as other direct tax revenue from energy production.

Royalty Revenues by Province
($ millions)

	1999/2000	2004/2005	2009/2010
British Columbia	670	2,037	1,694
Alberta	4,862	9,999	7,853
Saskatchewan	732	1,999	1,378
Manitoba	–	10	27

Source: Provincial government Budgets and Public Accounts documents.

Provincial Government Royalty Revenues
(as a % of total revenues)



Note: *Provincial Economic Accounts* present different figures from those found in provincial budgets and Public Accounts.
Source: Statistics Canada *Provincial Economic Accounts.*

Government Royalties

VOLATILITY

Although resource royalties benefit western Canadians by increasing the fiscal capacity of provincial governments in the region, they also bring a disadvantage in that reliance on resource revenue makes long-term fiscal planning considerably more difficult.

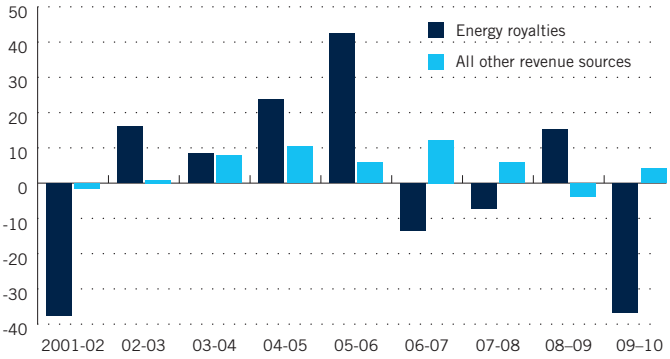
Compared to other more stable sources of government revenue like personal and corporate income taxes and sales taxes, energy royalties are prone to dramatic and often unpredictable swings. Moreover, as with other revenue sources, these swings are often procyclical (moving in the same direction as the economy). As a result, when the economy is strong in western Canada, there is a revenue windfall in the region, but when the economy weakens, governments face sharper declines in available funds compared to less resource-dependent provinces.

Natural gas royalties are particularly volatile. In the 1998-1999 fiscal year, the four western provinces together collected $1.7 billion in gas royalties. Two years later, that number had quintupled to $8.7 billion, but fell by 42.5% just a year later. By 2005-2006, gas royalties in the region had reached a record $10.6 billion but just four years later, gas royalties plunged to $2.0 billion – only slightly above 1998-1999 levels.

Crude Oil

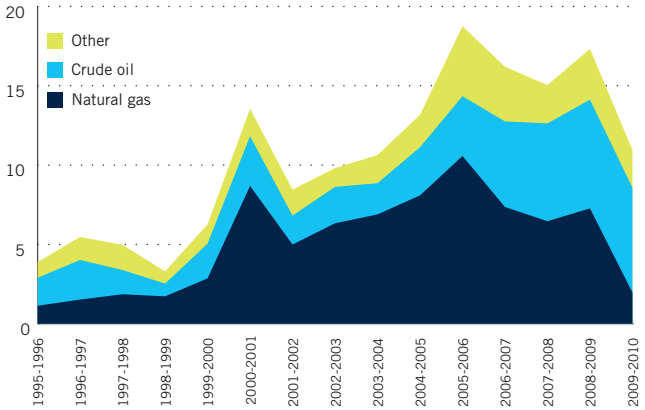
IS NOW THE LARGEST SOURCE OF ROYALTY REVENUE IN WESTERN CANADA

Annual Growth in Western Canadian Provincial Government Revenues (%)



Source: Canada West Foundation calculations using provincial government data.

Royalty Revenues in Western Canada by Source ($ billions)



Note: Other includes Crown land sales, leases and tenures; as well as taxes on freehold mineral rights, coal royalties and other unspecified fees.
Source: Canada West Foundation calculations using provincial government data.

Government Royalties

BY TYPE

BC is enjoying strong growth in revenue from sales of Crown Land tenures, which have nearly quadrupled over the past decade.

Typically, natural gas is the largest source of royalty revenue in Alberta, accounting for an average of 54% of provincial royalty revenue over the past decade. However, this distribution has changed rapidly in recent years due to the combination of plunging gas royalties and surging revenues from the oil sands. Oil sands royalties rose from $718 million in 2004-2005 to $3.2 billion in 2009-2010.

In Saskatchewan, crude oil is by far the largest source of provincial government royalties, accounting for more than two thirds of all royalties collected since 2000-2001. That share has been even higher in recent years because of strong growth in crude oil royalties in that province.

In Manitoba, petroleum royalties and fees make up just under half of all energy royalties collected in that province. Although modest, both royalties and Crown leases and sales have soared in recent years.

Energy Royalties by Type and by Province

	Value of energy royalties ($ millions)		Share of provincial energy royalties (%)		% of total government revenue	
	2009-2010	average: 2000-2010	2009-2010	average: 2000-2010	2009-2010	average: 2000-2010
Natural Gas						
British Columbia	406	1,179	23.97	60.71	1.08	3.54
Alberta	1,525	5,518	19.42	54.77	4.28	18.57
Saskatchewan	39	168	2.83	12.36	0.38	2.19
Manitoba	0	0	–	–	–	–
Western Canada	**1,970**	**6,865**	**17.99**	**51.26**	**2.11**	**8.42**
Crude Oil						
British Columbia	421	315	24.85	16.23	1.12	0.91
Alberta (conventional)	1,848	1,408	23.53	13.98	5.18	4.60
Alberta (oil sands)	3,160	1,440	40.24	14.29	8.86	4.15
Saskatchewan	1,161	933	84.25	68.74	11.31	10.99
Manitoba	13	8	47.24	44.56	0.13	0.09
Western Canada	**6,603**	**4,105**	**60.29**	**30.65**	**7.06**	**5.04**
Land sales/leases, etc.						
British Columbia	867	448	51.18	23.06	2.31	1.28
Alberta	1,165	1,427	14.84	14.17	3.27	4.51
Saskatchewan	151	228	10.96	16.80	1.47	2.40
Manitoba	6	3	22.51	15.27	0.06	0.03
Western Canada	**2,189**	**2,106**	**19.99**	**15.72**	**2.34**	**2.58**
Other						
British Columbia	0	0	–	–	–	–
Alberta	155	282	1.97	2.80	0.43	0.95
Saskatchewan	27	29	1.96	2.10	0.26	0.36
Manitoba	8	7	30.25	40.17	0.08	0.08
Western Canada	**190**	**318**	**1.74**	**2.37**	**0.20**	**0.39**
TOTAL						
British Columbia	1,694	1,942			4.51	5.72
Alberta	7,853	10,075			22.02	32.78
Saskatchewan	1,378	1,357			13.42	15.94
Manitoba	27	18			0.27	0.20
Western Canada	**10,952**	**13,393**			**11.71**	**16.43**

Note: Average royalty calculations for Manitoba are from 2002-2003 to 2009-2010. "Other" royalty revenues include taxes on freehold mineral rights, coal royalties and other unspecified fees. Crude oil revenues for BC include royalties from other mineral products. Data on Crown Land Tenures for BC include those associated with non-energy mineral extraction. Data on coal royalties in Saskatchewan are not available. **Source:** Provincial government Budgets and Public Accounts documents.

Indirect & Spillover Effects

GDP

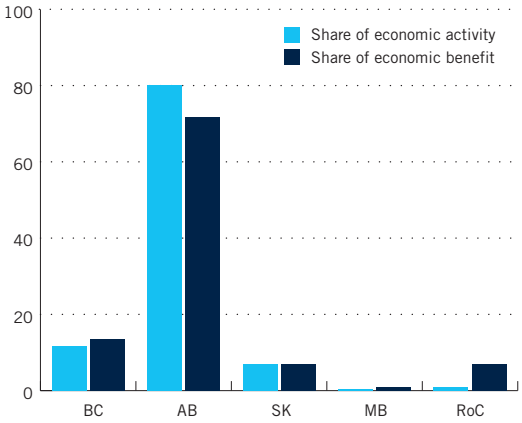
Canadians across the country benefit from the economic activity associated with energy production in western Canada. While there is far more to the region's energy mix than hydrocarbon production, a study by the Canadian Energy Research Institute (CERI) illustrates the extent to which western Canadian oil and gas activity translates into economic benefits in other provinces. Using information about existing input-output relationships between industries in Canada,[2] the CERI study examined the potential cumulative impacts of current and anticipated future investments in oil and gas projects, and related capital projects over a 25-year period.

According to CERI, the vast majority of economic benefits coming from petroleum-related projects in a province remain in that province. However, through contracts, supply relationships and other business linkages, there are significant spillover effects into other provinces as well. For example, oil and gas activity in Alberta is expected to generate a total of $2.5 trillion in cumulative economic output in that province over a 25-year period. However, about 11.4% of the economic benefit ($327 billion) will be felt in other provinces, most notably in Ontario ($116 billion) and BC ($93 billion).

Provinces outside western Canada are expected to produce just 1% of total oil- and gas-related economic activity over the study period, but will reap 7% of the overall economic benefits.

[2] That report, *Economic Impacts of the Petroleum Industry in Canada*, is available at www.ceri.ca/index.php/research/52-studies.

Spillover Effects (GDP) of Western Canadian Oil and Gas Activity (%)



Source: Canada West Foundation calculations using data from Canadian Energy Research Institute, *Economic Impact of the Petroleum Industry in Canada, 2009*.

Projected Economic (GDP) Impact of Western Canadian Oil and Gas Activity 2008-2033 ($ millions)

IMPACT ON	BC	AB	SK	MB	TOTAL
BC	376,078	93,093	7,557	271	476,999
AB	13,036	2,530,656	14,305	346	2,558,343
SK	2,528	44,346	198,305	173	245,352
MB	1,901	18,705	5,611	10,152	36,369
ON	12,432	116,168	16,369	612	145,581
QC	5,934	36,652	3,178	277	46,041
NB	599	3,634	374	27	4,634
NS	824	5,903	433	29	7,189
PE	118	736	64	5	923
NL	371	3,390	280	19	4,060
TER	498	3,894	271	10	4,673
TOTAL	**414,318**	**2,857,178**	**246,747**	**11,920**	**3,530,164**

Note: Figures may not add up due to rounding. These figures refer to the total economic impact of oil, gas and related capital investment projects expected to take place over a 25-year period beginning in 2008. Because a host of factors could influence economic activity in the oil and gas sector over a 25-year timeframe, it is important to view these figures not as a precise forecast of future economic activity, but rather as a measure of the extent to which the benefits of oil and gas and related capital spending in western Canada spill over into other provinces and territories.
Source: Canadian Energy Research Institute, *Economic Impact of the Petroleum Industry in Canada, 2009*.

Indirect & Spillover Effects

EMPLOYMENT

According to the Canadian Energy Research Institute, between 70% (Saskatchewan) and 83% (BC) of the employment generated by oil and gas activity is created in the province in which the activity itself is taking place. The remaining 17% to 30% is created in other provinces via indirect and induced impacts.

In total, 86% of the jobs created by oil and gas activity in western Canada are within the region. The remaining 14% are generated outside the region. CERI estimates that oil and gas sector activity in western Canada would create an estimated 2.1 million cumulative person-years of employment in Ontario over a 25-year period.[3]

[3] A person-year of employment is a job for one person for one year. A single job that lasts 30 years would be 30 person-years of employment, as would 30 construction jobs that each lasted for one year.

Projected Employment Impact of Western Canadian Oil and Gas Activity 2008-2033 (000s of person-years)

		BC	AB	SK	MB	TOTAL
IMPACT ON	**BC**	**2,778**	1,265	90	4	4,137
	AB	166	**13,750**	117	4	14,037
	SK	41	579	**1,421**	3	2,044
	MB	35	342	81	**106**	564
	ON	196	1,689	236	10	2,131
	QC	99	600	54	4	757
	NB	12	71	8	1	92
	NS	16	106	8	1	131
	PE	2	15	1	–	18
	NL	7	69	5	–	81
	TER	7	45	2	–	54
	TOTAL	**3,359**	**18,530**	**2,024**	**132**	**24,046**

Note: Figures may not add up due to rounding. These figures include direct, indirect and induced employment resulting from oil, gas and related capital investment projects expected to take place over a 25-year period beginning in 2008. Because a host of factors could influence employment in the oil and gas sector over a 25-year timeframe, it is important to view these figures not as a precise forecast of future job creation, but rather as a measure of the extent to which the benefits of oil and gas and related capital spending in western Canada spill over into other provinces and territories.
Source: Canadian Energy Research Institute, *Economic Impact of the Petroleum Industry in Canada, 2009.*

Indirect & Spillover Effects

GOVERNMENT REVENUE

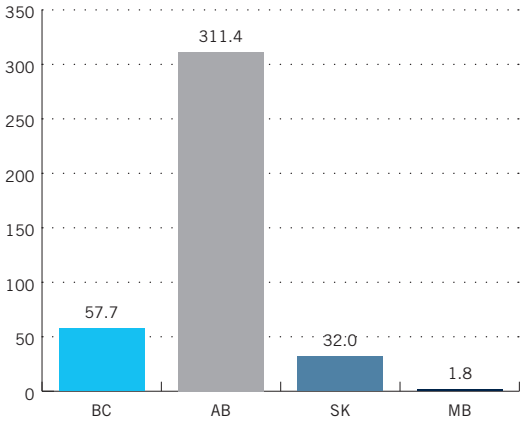
The economic activity and jobs created by western Canadian oil and gas activity outside the region generate revenue for provincial and federal governments as well. CERI estimates that petroleum-related projects in western Canada will, over 25 years, generate $403 billion in corporate, personal and sales tax revenues for the federal government. The vast majority of that total ($311 billion) is expected to come from taxes on oil- and gas-related activity in Alberta.

Oil and gas projects in western provinces will generate revenue for other provincial governments as well. While only the host province can collect royalties and revenue from land sales and leases, other provinces tax the income, consumption and profits derived from spillover economic activity.

For example, petroleum-based activity in BC is expected to generate, over a 25-year period, $1.4 billion in cumulative tax revenues in other western provinces. In Alberta, the spillover benefits to other provincial governments in the region total $21.5 billion.

Provincial governments outside the West also benefit from the region's oil and gas sector. Over 25 years, petroleum-related activity in the West is expected to contribute $30.8 billion to provincial government coffers in other parts of the country. Nearly two thirds of that total would be in Ontario, although on a per capita basis, there would be comparable benefits in Nova Scotia and in Newfoundland and Labrador.

Projected Federal Taxes Generated by Western Canadian Oil and Gas Activity 2008-2033 ($ billions)



Source: Canada West Foundation calculations using data from Canadian Energy Research Institute, *Economic Impact of the Petroleum Industry in Canada, 2009*.

Projected Provincial Taxes Generated by Western Canadian Oil and Gas Activity 2008-2033 ($ millions)

IMPACT ON	BC	AB	SK	MB	TOTAL
BC	49,924	12,358	1,003	36	63,321
AB	784	152,257	861	21	153,923
SK	341	5,986	26,767	23	33,117
MB	317	3,119	936	1,693	6,065
ON	1,639	15,317	2,158	81	19,195
QC	1,046	6,459	560	49	8,114
NB	104	633	65	5	807
NS	155	1,109	81	5	1,350
PE	25	155	13	1	194
NL	65	598	49	3	715
TER	56	384	26	–	466
TOTAL	**54,457**	**198,375**	**32,519**	**1,918**	**287,267**

Note: Figures may not add up due to rounding. These figures refer to total provincial taxes generated as a result of spillover economic activity from oil, gas and related capital investment projects expected to take place in western Canada over a 25-year period beginning in 2008. Because a host of factors could influence oil and gas sector activity over a 25-year timeframe, it is important to view these figures not as a precise forecast of future tax revenues generated, but rather as a measure of the extent to which the benefits of oil and gas and related capital spending in western Canada spill over into other provinces and territories.
Source: Canadian Energy Research Institute, *Economic Impact of the Petroleum Industry in Canada, 2009*.

Conclusion

Energy production provides important economic benefits to western Canadians. While the benefits are clearly greatest in Alberta which is the dominant energy producer in the region, western Canada's economic prosperity is tied to the continued production, expansion and development of its energy resources.

At the same time, however, the tremendous economic benefits that come with the region's energy wealth bring with them a number of risks and challenges. Perhaps the most important of these is the fact that the region is vulnerable to the boom-bust cycle associated with energy production, especially in the oil and gas sector. This issue is of particular concern in Alberta and Saskatchewan, the two provinces where the oil and gas sector makes the largest contribution to provincial economic activity. The trend in recent years toward increasingly dramatic fluctuations in oil and gas prices only exacerbates this tendency.

These fluctuations create significant challenges for the provincial economies in the region. While the disadvantages to more severe economic downturns and recessions are obvious, economic booms create problems as well. Labour shortages and supply constraints have featured prominently in recent energy-induced boom periods in western Canada, driving up production and construction costs and generating regional inflationary pressures.

In addition, the boom-bust nature of energy production makes fiscal planning difficult in provinces where resource royalties are an important source of government revenue. Not only do resource revenues fluctuate dramatically from one year to the next, making long-term fiscal planning extraordinarily difficult, but they move in step with economic growth in the region. As a result, when provincial economies are healthy and revenue strong, provinces receive an additional fiscal windfall from resource royalties. Conversely, when the economy weakens, resource revenue can plummet, leaving provinces ill-equipped to implement countercyclical economic policies.

Another challenge facing the region is the need to effectively communicate the extent to which western Canadian energy development benefits all of Canada. Not only do our energy resources create jobs, economic growth and government revenues in other provinces, but because resource revenues raise the fiscal capacities of Alberta, BC and Saskatchewan, they also increase federal-provincial equalization transfers to have-not provinces as a result. Effective communication of how energy developments in western Canada benefit all Canadians could go a long way toward ensuring that Canadians view the West's energy wealth as a national asset that provides national benefit.

ENERGY TRADE & TRANSPORTATION

77.5%
of Canada's energy exports in 2011 came from the western provinces

99.4%
of western Canada's crude oil exports go to the United States

99.3%
of western Canada's electricity exports are from BC and Manitoba

Western Canada is a net importer of refined petroleum products

61.3%
of western Canada's coal exports go to Japan, South Korea and China

From 2008 to 2011, natural gas exports from western Canada have fallen by

59%

Introduction

Western Canadians produce energy far in excess of the region's needs. While some of this surplus energy is shipped to other provinces, most is exported abroad. Indeed, energy exports are a major driver of economic growth and prosperity in the West. Although there is significant variation in export levels across the provinces, for western Canada as a whole, energy products account for more than half of total merchandise exports.

The overwhelming majority of the region's energy exports go to US markets. The US accounts for 100% of the West's natural gas and electricity exports and more than 99% of international crude oil sales. Coal is the only form of energy produced in western Canada that is exported largely to non-US destinations. Only about 5.3% of western Canadian coal was shipped to the US in 2011. Most went to Japan, South Korea and China.

The US dominance of western Canadian energy exports is a result of the fact that the energy-related transportation infrastructure in western Canada is designed primarily to take advantage of the US market. In the case of electricity, most major electricity transmission lines run north-south and not east-west. As a result, there is relatively little interprovincial trade in electricity in western Canada.

Similarly, most natural gas pipelines in the western provinces are directly linked to the main distribution hubs in the US. The same is true of virtually all oil pipelines.

There is also only very limited capacity to export western Canadian energy to non-US markets. It is impractical to export electricity to any other country; there are no pipelines to deliver natural gas to the BC coast (or facilities in place to convert natural gas into liquid form for overseas transport); and there is only very modest pipeline capacity in place linking Alberta and Saskatchewan oil producers to BC shipping terminals.

One important limitation in this overview of energy trade in western Canada is that data are typically available only on net interprovincial trade flows between neighbouring provinces. As such, there is no way to determine the total volume of energy traded between provinces, only the net exchange can be calculated. Neither is there a way to track interprovincial energy exports across more than two provinces. For example, net flows of natural gas into Manitoba are recorded solely as net imports from Saskatchewan, even if some of that gas may have been purchased from Alberta suppliers.

Note: Unless stated otherwise, data in this section refer to international trade.

Overview

ENERGY EXPORTS BY PROVINCE

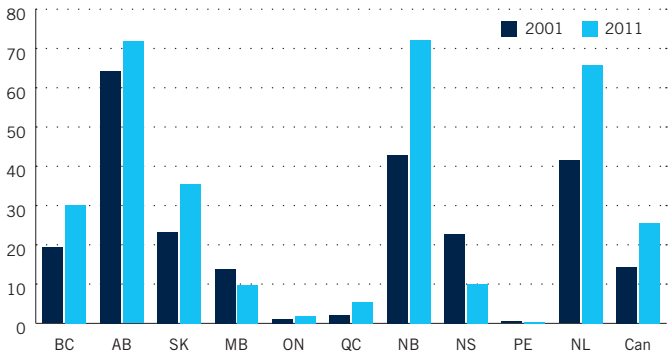
Western Canada dominates Canadian international energy exports. As a whole, the region exported $88.9 billion in energy products in 2011 and accounted for 77.5% of Canada's overall energy exports that year. The vast majority of those exports came from Alberta which alone contributed $67.2 billion to total energy exports.

Although Alberta is far and away the largest energy exporting province, Saskatchewan and BC are also major energy exporters. At $10.5 billion in exports in 2011, Saskatchewan is the second largest provincial exporter, while BC sits in third position at $10.0 billion. For its part, Manitoba's energy exports totalled $1.2 billion in 2011.

Energy is a major component of western Canadian exports. Over half of all exports from the western provinces in 2011 were electricity, coal, fossil fuels, refined petroleum and other energy products.

Moreover, energy represents a growing share of western Canadian exports. In 2001, energy products accounted for 44.8% of total exports from the western provinces. By 2011, this share had risen to 52.7%. Manitoba is the only province in the region where energy products made up a smaller share of total exports in 2011 compared to a decade earlier.

Energy Exports as a % of Total Provincial Exports



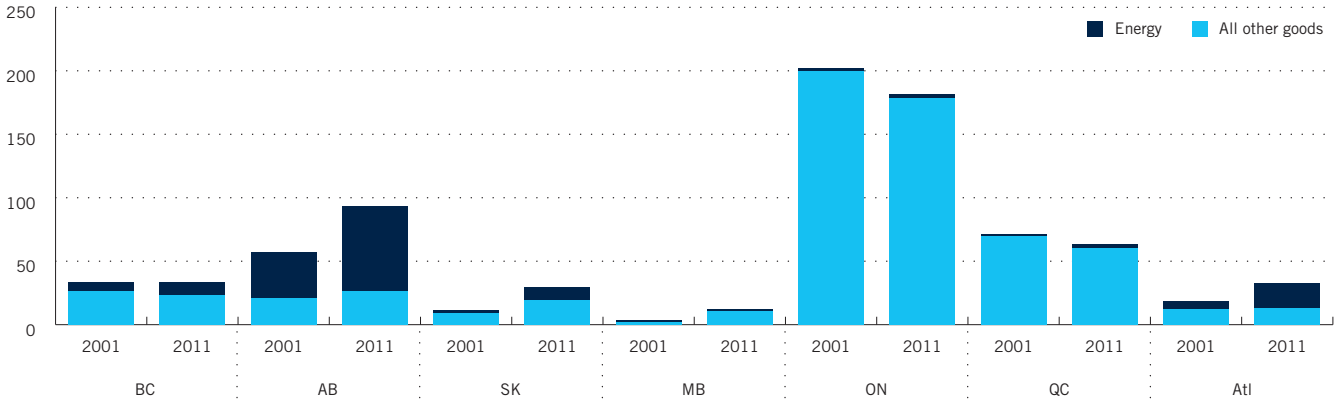
Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

Exports of Energy Products by Province ($ billions)

	2001	2011
British Columbia	6.4	10.0
Alberta	36.9	67.2
Saskatchewan	2.7	10.5
Manitoba	1.3	1.2
Ontario	2.4	3.2
Quebec	1.6	3.4
New Brunswick	2.4	8.7
Nova Scotia	1.3	0.4
Prince Edward Island	0.0	0.0
Newfoundland & Labrador	1.5	8.0

Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

Exports of Energy Products by Province ($ billions)



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

Overview

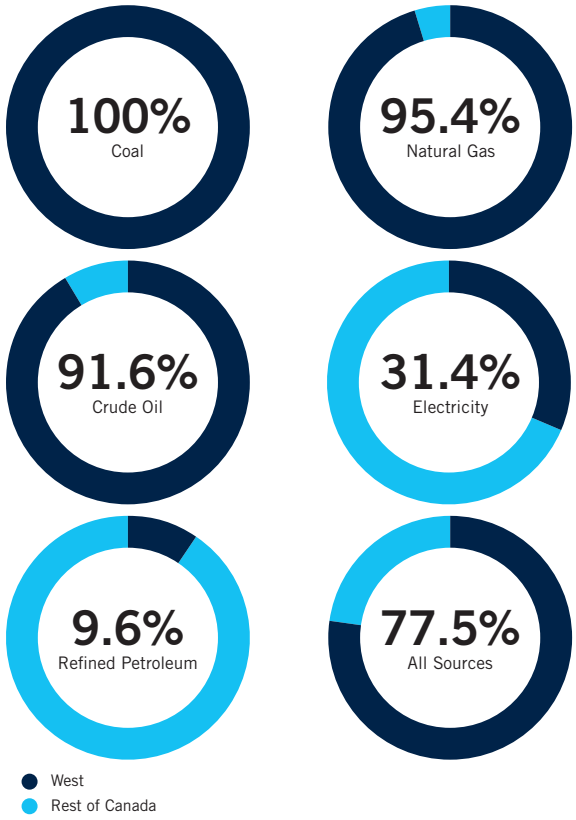
ENERGY EXPORTS BY TYPE

The western provinces account for the vast majority of Canada's exports of most types of energy. A full 100% of Canada's coal exports, 95.4% of its natural gas exports and 91.6% of its crude oil exports come from the West. However, the region accounted for just 9.6% of refined petroleum exports and 31.4% of electricity exports. Most of Canada's refined petroleum exports originate in New Brunswick, while most exported electricity comes from Quebec and Ontario.

Within western Canada, each province's energy exports tend to be dominated by one or two specific products. In BC, coal is by far the province's largest energy export, most of which is used to power smelting operations. Together, coal and natural gas – BC's second largest energy export – made up 90.1% of the province's energy exports in 2011.

In Alberta, crude oil and natural gas are the largest energy exports, together making up 93.5% of total energy sales abroad. In Saskatchewan, crude oil alone accounts for 95.4% of energy exports, while in Manitoba, crude oil and electricity made up 90.7% of energy exports in 2011.

Western Canada's Share of National Energy Exports 2011



Energy Exports 2011

British Columbia

	$ millions	% of Canadian exports
Coal	7,140.9	89.14
Crude oil	120.5	0.18
Refined petroleum	429.6	2.44
Natural gas	1,911.6	14.24
Natural gas liquids	42.0	1.43
Electricity	338.3	16.52
All others	60.5	3.60
TOTAL	**10,043.4**	**8.76**

Alberta

	$ millions	% of Canadian exports
Coal	869.7	10.86
Crude oil	52,104.9	75.74
Refined petroleum	1,212.2	6.90
Natural gas	10,684.0	79.59
Natural gas liquids	1,907.0	64.82
Electricity	1.0	0.05
All others	387.6	23.08
TOTAL	**67,166.4**	**58.56**

Saskatchewan

	$ millions	% of Canadian exports
Coal	0.0	–
Crude oil	10,016.0	14.56
Refined petroleum	27.8	0.16
Natural gas	209.5	1.56
Natural gas liquids	49.3	1.67
Electricity	3.5	0.17
All others	195.1	11.62
TOTAL	**10,501.2**	**9.16**

Manitoba

	$ millions	% of Canadian exports
Coal	0.0	–
Crude oil	748.5	1.09
Refined petroleum	19.4	0.11
Natural gas	0.0	–
Natural gas liquids	34.5	1.17
Electricity	300.5	14.67
All others	53.8	3.21
TOTAL	**1,156.7**	**1.01**

Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

Crude Oil

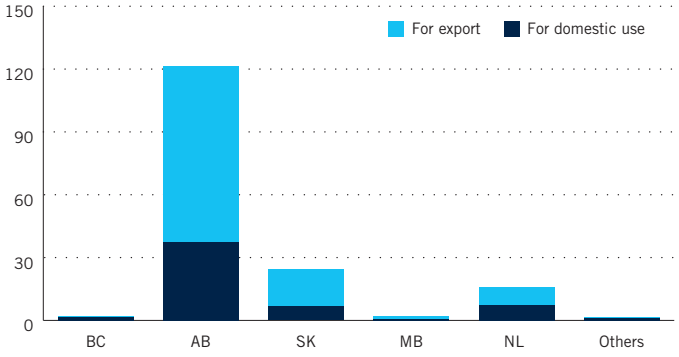
TRADE & DISPOSITION

Western Canada is home to an extensive and well-developed system of pipelines to transport crude oil into the United States. As such, most crude oil produced in the region is not refined at home but instead is shipped to the US where it is refined into petroleum products for direct use. In 2010, 69.0% of western Canada's overall crude oil production was exported, the vast majority of which was sent to US Petroleum Administration for Defence District II (PADD II) – the US Midwest. The remainder was either refined within the region for domestic consumption or sent by US pipeline to Ontario.

There is limited capacity in place to transport western Canadian crude oil to markets across the Pacific Ocean. Only about 1.2% of crude oil (by volume) is exported to non-US destinations.

While western Canada exports its crude oil to the US, eastern Canada imports most of its crude oil supply from overseas. Major sources of crude oil in Quebec and Atlantic Canada include Algeria, the United Kingdom, Nigeria and Norway.

Disposition of Canadian Crude Oil 2010
(millions of cubic metres)



Source: Statistics Canada *Energy Statistics Handbook, Q2 2011.*

Crude Oil Disposition in Canada 2010
(000s of cubic metres)

Production by Province	
NF	16,008.7
NS	389.5
ON	83.3
MB	1,849.5
SK	24,558.4
AB	121,598.9
BC	1,931.9
NT	955.3
TOTAL	167,375.5

Exports by Province	
NF	8,754.7
NS	253.7
MB	1,013.9
SK	17,883.5
AB	84,349.2
BC	2,07.3

Exports by Destination (US)	
PADD I	10,454.1
PADD II	70,368.6
PADD III	1,014.1
PADD IV	17,876.4
PADD V	11,360.3
Other Countries	1,388.8

Imports by Province	
To Ontario	4,471.3
To Quebec	19,585.7
To Atlantic	21,068.7

Imports by Country of Origin	
Algeria	6,549
Saudi Arabia	3,986.5
Norway	4,191.4
UK	5,609.9
Angola	3,487.8
Iraq	2,327.4
Nigeria	4,319.6
Venezuela	1,539.4
Mexico	1,492.5
Russia	1,069.4
US	677.8

Deliveries to Provincial Refineries	
Atl	25,410.3
QC	21,836.7
ON	20,279.6
SK	5,853.9
AB	25,488.9
BC	2,783.5
TOTAL	101,652.9

Source: Statistics Canada *Energy Statistics Handbook, Q2 2011.*

Crude Oil

EXPORTS BY PROVINCE

Although it mostly comes from just two provinces, crude oil is western Canada's most valuable export product. Total crude exports were valued at $63.0 billion in 2011, accounting for 91.6% of Canadian crude exports and 37.4% of total exports of all goods from western Canada.

The vast majority of Canada's crude oil exports come from Alberta and Saskatchewan. Alberta leads the way with $52.1 billion in crude sales abroad in 2011, while exports from Saskatchewan were valued at $10.0 billion that year. Most of the remaining $6.7 billion in crude oil exports in 2011 originated in Newfoundland and Labrador, with small amounts coming from Manitoba, Nova Scotia and British Columbia.

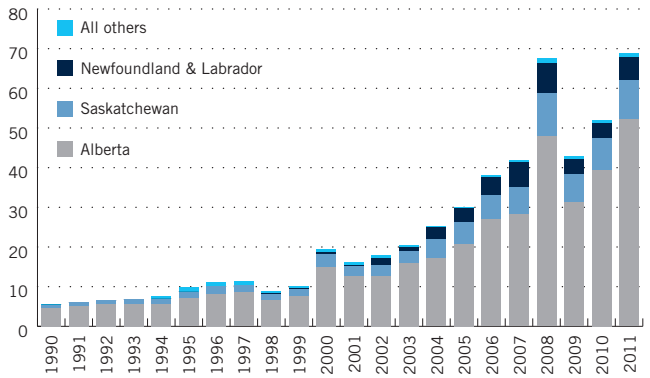
Crude oil is Alberta's dominant export product. In 2011, crude oil accounted for 55.7% of Alberta's total exports worldwide. On the strength of its crude oil sales, which have doubled since 2008, Alberta is the second largest exporting province in Canada, behind only Ontario. Moreover, crude oil represents a growing share of total exports in Alberta; in 2000, crude oil accounted for 22.0% of provincial exports. Similarly, crude oil accounted for 33.9% of total exports from Saskatchewan in 2011, up from 21.7% of exports a decade earlier.

For its part, Manitoba is Canada's fourth largest exporter of crude oil. Exports rose sharply in 2011, but remained at a comparatively modest $748 million that year. In BC, crude oil is not a significant export product, with total international sales of $120 million in 2011. Crude oil made up 6.3% of Manitoba's exports that year and just 0.3% of exports from BC.

$52.1 BILLION

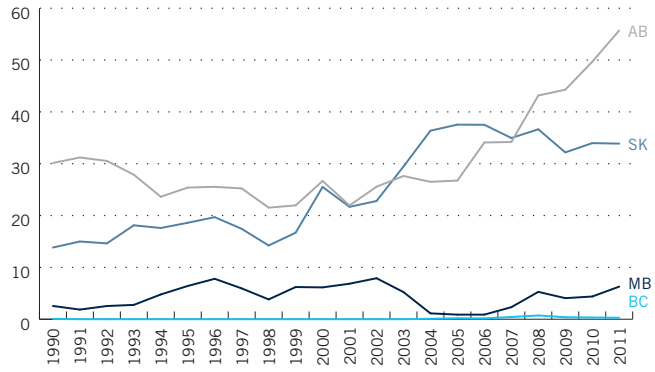
CRUDE OIL INTERNATIONAL EXPORTS FROM ALBERTA IN 2011

Crude Oil International Exports by Province ($ billions)



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

Crude Oil as a % of Total Provincial International Exports



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

Crude Oil International Exports by Province

	2001		2011	
	$ millions	% of total oil exports	$ millions	% of total oil exports
Alberta	12,629	78.5	52,105	75.7
Saskatchewan	2,544	15.8	10,016	14.6
Newfoundland & Labrador	226	1.4	5,680	8.3
Manitoba	664	4.1	748	1.1
Nova Scotia	19	0	128	0.2
British Columbia	–	–	120	0.2

Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

Crude Oil

EXPORTS BY DESTINATION

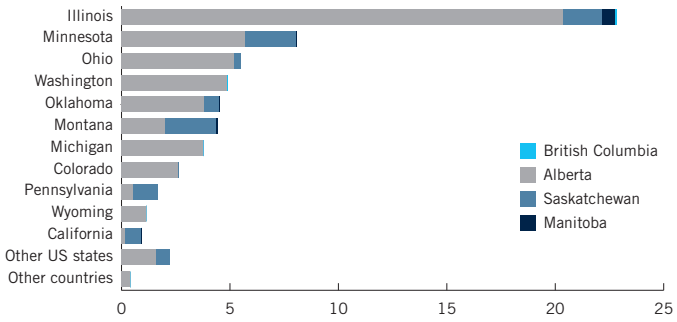
As noted earlier, the US is the destination for nearly all of western Canada's crude oil exports. In 2011, $62.6 billion in crude exports was transported to US markets, while just $407 million of crude was shipped to other countries.

Because most pipeline capacity leading out of the western provinces goes to the US Midwest (the PADD II region), western Canada exports more crude oil to states in that region than anywhere else in the US. Illinois alone accounted for 36.2% of western Canadian crude oil exports in 2011. An additional 12.8% of crude oil exports went to Minnesota and 8.7% to Ohio.

However, western Canadian crude oil finds its way all across the mainland United States. The region exports significant quantities of crude oil to all five PADDs in the US. Saskatchewan, in particular, sells much of its oil in Montana, Pennsylvania and California.

Alberta is the only province which exported crude oil in any significant quantities to non-US destinations in 2011. The province shipped $407 million in crude oil to China in 2011, more than double 2010 levels.

Crude Oil International Exports by Destination 2011
($ billions)



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

Top International Export Destinations for Crude Oil 2011

Alberta

	Value	% of exports	
	$ millions	of crude oil	of all products
Illinois	20,360	39.1	18.4
Minnesota	5,673	10.9	5.1
Ohio	5,199	10.0	4.7
Washington	4,853	9.3	4.4
Oklahoma	3,812	7.3	3.4
Other US	11,801	22.6	10.6
Other countries	407	0.8	0.4

British Columbia

	Value	% of exports	
	$ millions	of crude oil	of all products
Illinois	80	66.3	0.2
Ohio	14	11.4	0.0
Montana	10	8.3	0.0
Oklahoma	6	4.8	0.0
Minnesota	5	4.1	0.0
Other US	6	5.0	0.0
Other countries	0	0.0	0.0

Saskatchewan

	Value	% of exports	
	$ millions	of crude oil	of all products
Minnesota	2,370	23.7	8.0
Montana	2,365	23.6	8.0
Illinois	1,784	17.8	6.0
Pennsylvania	1,127	11.2	3.8
California	719	7.2	2.4
Other US	1,652	16.5	5.5
Other countries	0	0.0	0.0

Manitoba

	Value	% of exports	
	$ millions	of crude oil	of all products
Illinois	597	79.8	4.6
Montana	56	7.5	0.4
Minnesota	38	5.1	0.3
Oklahoma	24	3.3	0.2
California	17	2.2	0.2
Other US	16	2.2	0.3
Other countries	0	0.0	0.0

Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

Refined Petroleum

EXPORTS & IMPORTS

Most refined petroleum produced in western Canada (gasoline, diesel, jet fuel, etc.) is consumed in the region. In 2010, the four provinces produced 38.3 million cubic metres of refined petroleum liquids, about 6.5% of which was exported and only a small fraction of which was shipped to other provinces.

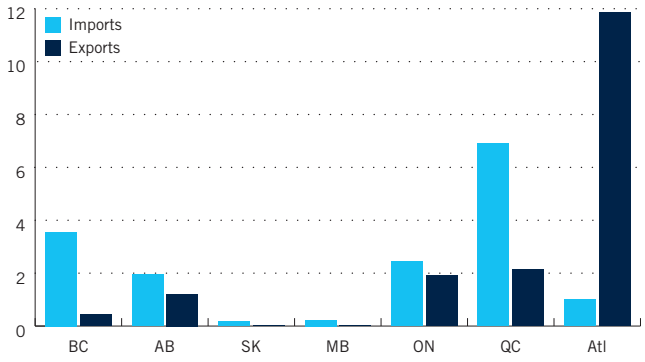
Perhaps surprising given the quantities of crude oil produced in the region, western Canada is a net importer of refined petroleum products. In 2011, the four western provinces exported just under $1.7 billion of refined petroleum, while importing about $5.9 billion.

Alberta is the only province in western Canada that is usually a net exporter of refined petroleum products. However, it has been a net importer in two of the past three years. In 2009 there was a sharp spike in imports because of extended refinery outages in the province, which led to region-wide gasoline and diesel shortages that year. Similarly, supply disruptions in 2011, in part because of forest fires in the Slave Lake area in May, contributed to another sharp increase in diesel and gasoline imports.

Exports of refined petroleum from the western provinces have been volatile since the late 1980s. Although the value of exports has generally been rising since the mid-1990s, export volumes remain below levels seen earlier that decade. By contrast, imports of refined petroleum products have been rising steadily; volumes have increased by more than a factor of four since the late 1980s.

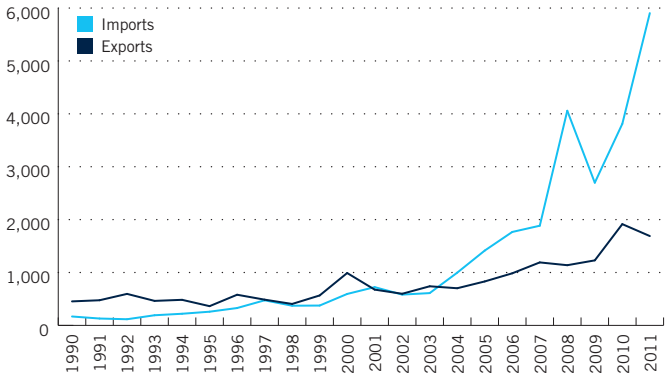
Because of the relatively large refining capacity in New Brunswick and Newfoundland and Labrador, Atlantic Canada is the only region that is a net exporter of refined petroleum products. Exports exceed imports in Atlantic Canada by a considerable margin.

Refined Petroleum Products Trade 2011 ($ billions)



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online).*

Western Canada's Trade in Refined Petroleum Products ($ millions)



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online).*

Refined Petroleum

EXPORTS BY PROVINCE

Within western Canada, Alberta is by far the largest exporter of refined petroleum products. Its $1.2 billion in exports in 2011 accounted for 71.8% of the total $1.7 billion in refined petroleum exports from the four western provinces that year. BC was the next largest exporter, at $430 million in 2011. Exports from Saskatchewan and Manitoba were much lower, at $27.8 million and $19.4 million, respectively.

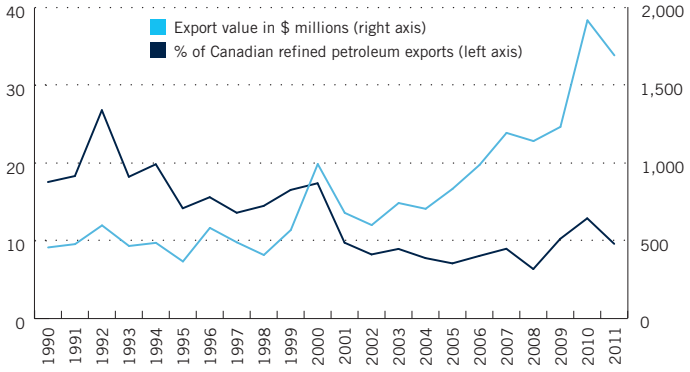
Not only do Alberta and BC sell more refined petroleum abroad than the other western provinces, but their exports are growing rapidly as well. In Alberta, exports of refined petroleum rose by 67% from 2006 to 2011. In BC, the growth rate was even higher, at 164%.

However, western Canadian exports of refined petroleum products are just a fraction of the level of exports from some other provinces. In total, the western provinces made up just 9.6% of Canadian shipments of these products in 2011. New Brunswick, home to Canada's largest oil refinery in Saint John, was by far Canada's largest exporter of refined petroleum, at $9.5 billion in 2011. Shipments from New Brunswick are worth more than those from all other provinces combined.

16%

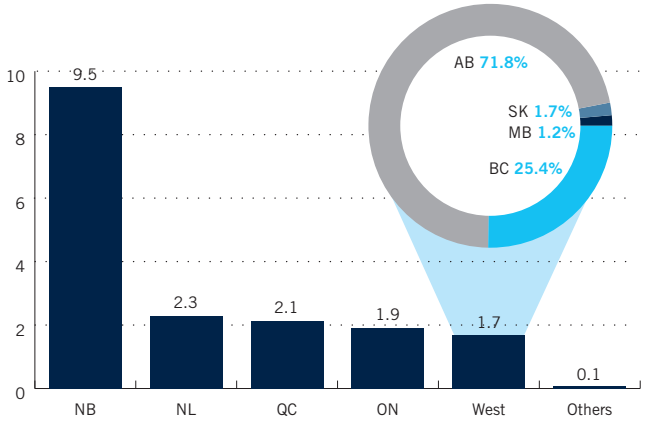
AVERAGE ANNUAL GROWTH IN BC'S REFINED PETROLEUM INTERNATIONAL EXPORTS SINCE 2001

Western Canadian Refined Petroleum International Exports



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online).*

Refined Petroleum International Exports 2011
($ billions)



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online).*

Refined Petroleum

EXPORTS BY DESTINATION

The vast majority of refined petroleum exports from western Canada are sold into the US market – 98.5% of the $1.7 billion total in 2011. For Saskatchewan and Manitoba, the US was essentially the only destination for these products, while Alberta and BC have been slightly more active in other markets. In 2011, the Netherlands ($18.3 million) was the largest non-US destination for western Canadian refined petroleum products. Small shipments totalling about $1 million each were also sent to Mexico, China and Saudi Arabia.

Within the United States, the destination of refined petroleum exports depended on the province of origin. Alaska and Washington State were by far the most important export destinations for BC, accounting for 76.3% of total refined petroleum exports in 2011. For Alberta, exports were spread across a wide range of US States, led by New Jersey and Texas. North Dakota and Minnesota were by far the largest buyers of refined petroleum products from Manitoba, while North Dakota and Texas held that distinction for Saskatchewan.

Top 5 Refined Petroleum International Export Destinations by Province 2011

Alberta

	$ millions	% of total
New Jersey	346.0	28.5
Texas	120.5	9.9
Louisiana	118.4	9.8
New York	82.5	6.8
Washington	79.7	6.6
Other countries	23.5	1.9

British Columbia

	$ millions	% of total
Washington	220.4	51.3
Alaska	107.5	25.0
California	69.8	16.3
Oregon	20.9	4.9
Hawaii	2.8	0.7
Other countries	1.7	0.4

Saskatchewan

	$ millions	% of total
Texas	9.8	35.4
North Dakota	9.3	33.4
Michigan	3.3	11.9
New Mexico	1.7	6.2
Wisconsin	1.7	6.0
Other countries	0.0	0.0

Manitoba

	$ millions	% of total
Minnesota	12.3	63.3
North Dakota	6.1	31.5
Colorado	0.8	4.3
Montana	0.1	0.4
Texas	0.0	0.2
Other countries	0.0	0.1

Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

Refined Petroleum

IMPORTS

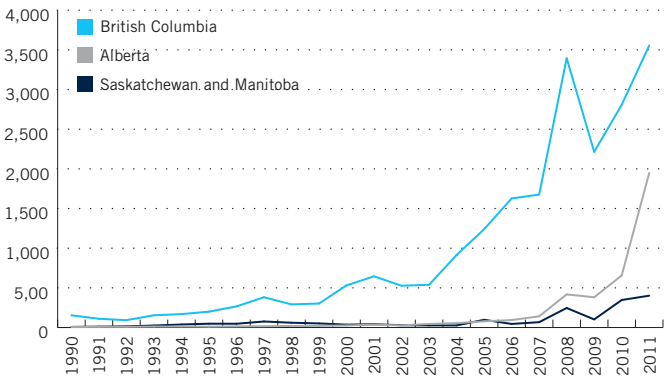
Western Canada imported a record $5.9 billion of refined petroleum products in 2011. BC was by far the largest importer in the region, with purchases totalling $3.6 billion. Alberta accounted for most of the remainder, with imports of $1.9 billion. For their part, refined petroleum imports into Manitoba and Saskatchewan were relatively modest, at $231 million and $170 million, respectively.

BC is also by far the fastest-growing importer of refined petroleum products. Imports into that province have more than doubled since 2006. The increase in Alberta has been even more rapid, although, as noted earlier, supply disruptions, as well as higher energy prices, are likely contributing factors behind the increase in imports across western Canada.

Most of western Canada's refined petroleum imports – about 81.5% in 2011 – came from the US. For BC, most of those imports came from Washington State, California and Texas. For Alberta, almost all imports came from Illinois, while Illinois, Montana and Minnesota were among the leading US sources of imports into Saskatchewan and Manitoba.

Comparing the trade balance in refined petroleum products in western Canada with the rest of the country reveals the extent to which Canada operates a north-south trade market for energy products. While western Canada ships tremendous quantities of crude oil to the US, it is a net importer of the refined product. In eastern Canada, however, the opposite is true; it imports crude oil from overseas and exports the finished product to the US, the European Union and Argentina.

Imports of Refined Petroleum Products ($ millions)



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

Top 5 Sources of Refined Petroleum Imports by Province 2011

Alberta

	$ millions	% of total
United States	1,627.0	83.5
Mexico	255.3	13.1
Saudi Arabia	52.4	2.7
Venezuela	11.6	0.6
Russia	1.1	0.1

British Columbia

	$ millions	% of total
United States	2,785.2	78.3
Peru	352.5	9.9
South Korea	181.8	5.1
Japan	121.4	3.4
Singapore	82.6	2.3

Saskatchewan

	$ millions	% of total
United States	170.135	99.810
Re-imports (Canada)	0.286	0.168
Netherlands	0.021	0.013
Japan	0.004	0.002
France	0.003	0.002

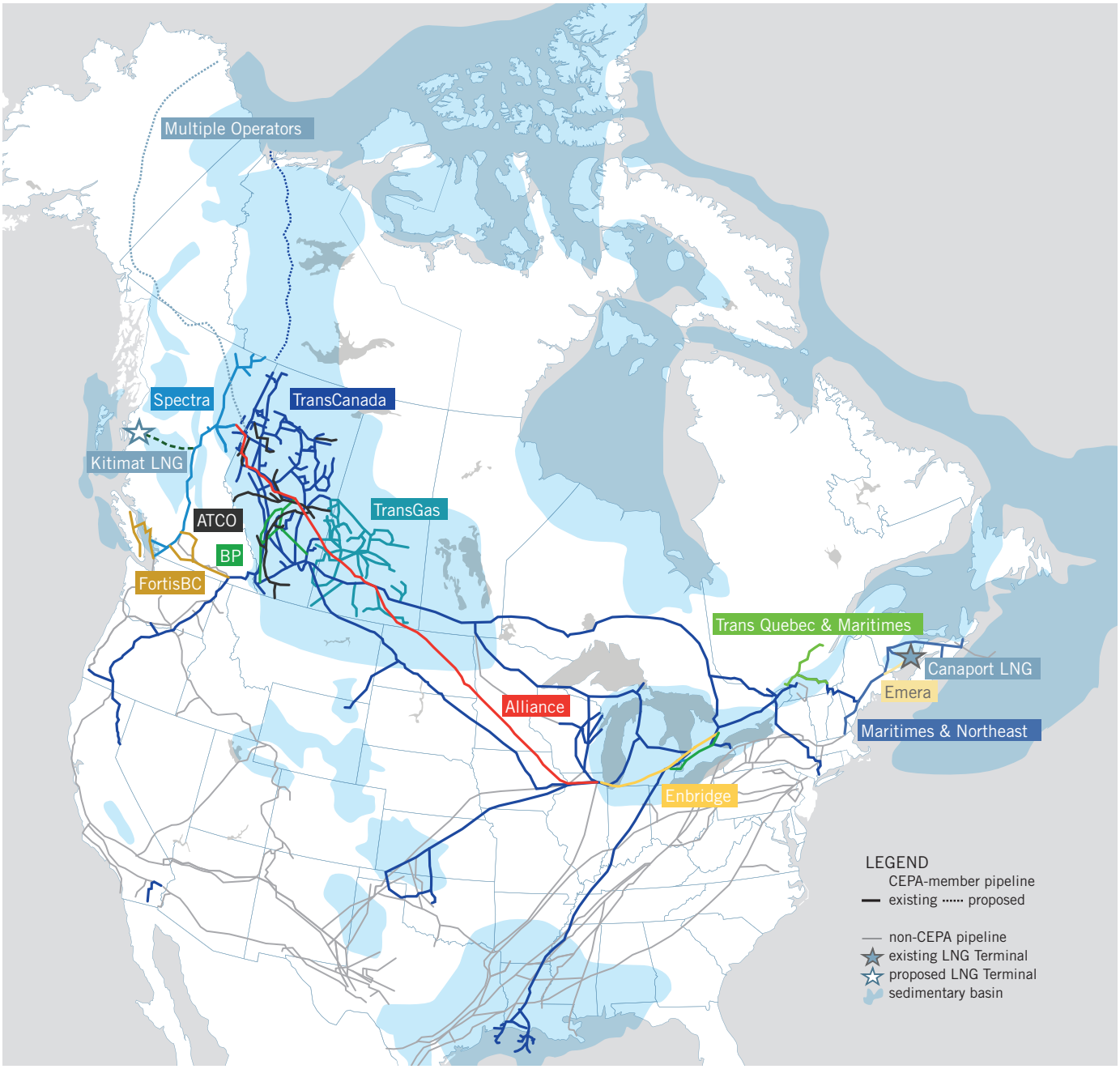
Manitoba

	$ millions	% of total
United States	230.602	99.883
Re-imports (Canada)	0.075	0.032
Denmark	0.059	0.026
Germany	0.032	0.014
China	0.022	0.010

Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

Natural Gas

TRANSMISSION



Source: Canadian Energy Pipeline Association (CEPA).

Natural Gas

TRADE & DISPOSITION

As with crude oil, western Canada has a well-developed network of pipelines for the transportation of natural gas. The vast majority of western Canada's natural gas production is exported to the United States.

At present, western Canada lacks the ability to export natural gas overseas. Gaining access to overseas markets could be an important factor behind future gas development in western Canada given that the abundance of shale gas in the US makes the outlook uncertain for the future of gas exports to that market.

75,400
GIGALITRES

AMOUNT OF NATURAL GAS THAT LEFT ALBERTA FOR EXPORT TO OTHER PROVINCES AND THE US

Natural Gas Supply and Disposition 2010
(gigalitres)

	Production	International Exports	International Imports	Net inter-provincial exports	Other adjustments	Total available for use within province
BC	33,112	28,018	232	-5,344	-1,496	9,174
AB	112,067	421	–	74,979	224	36,891
SK	6,700	36,668	–	-38,418	213	8,664
MB	–	13,821	–	-15,747	-31	1,895
ON	170	12,009	20,021	-8,996	7,548	24,725
QC	–	1,080	–	-6,572	-58	5,434
NB	166	3,573	–	-2,343	2,087	1,023
NS	3,311	–	–	2,343	60	1,028
PE	–	–	–	–	–	–
NL	565	–	–		–	565
Can	156,304	95,589	22,621	–	6,179	89,514

Note: Data on international and interprovincial trade refer to the point at which natural gas crosses the border. Most natural gas outflows from Alberta to other provinces is exported to the US from those locations.
Source: Statistics Canada Table 128-0017.

Natural Gas

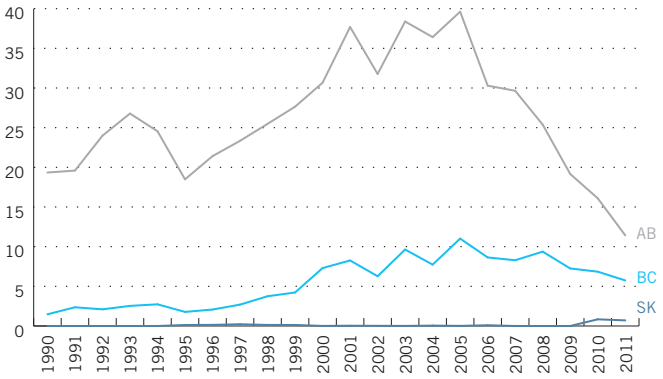
EXPORTS BY PROVINCE

Natural gas exports from western Canada were valued at $12.8 billion in 2011 accounting for 95.4% of Canada-wide gas exports that year. At $10.7 billion, Alberta alone made up 79.6% of Canadian natural gas exports in 2011 and 83.4% of gas exports from the western provinces. BC accounted for most of western Canada's remaining natural gas exports ($1.9 billion). In addition, Saskatchewan exported $210 million in natural gas in 2011, marking the second year in a row that the province has exported more than $200 million in natural gas exports. New Brunswick and Nova Scotia account for the remaining 4.6% of Canadian natural gas exports.

The total value of natural gas exports from western Canada has fallen dramatically in recent years. For the region as a whole, gas exports in 2011 were 59% below 2008 levels. While most obvious in Alberta, this trend holds true in other provinces as well.

Although declining production and increased demand for natural gas for oil sands production play a role, the biggest factor behind the drop in the value of natural gas exports from the western provinces is low prices. As noted earlier, natural gas prices fell by more than half from 2008 to 2009 and have remained low since.

Natural Gas as a % of Total Provincial International Exports



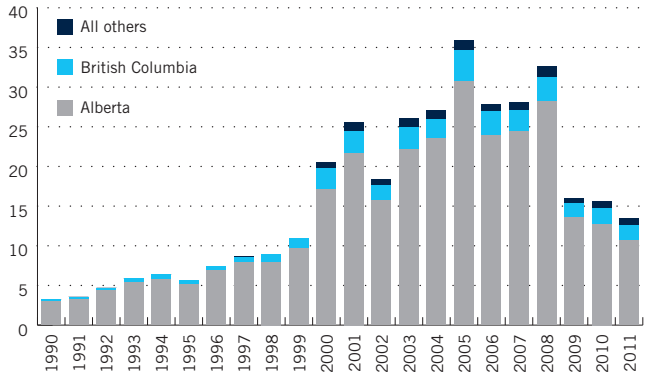
Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online).*

International Natural Gas Exports by Province

	2001		2011	
	$ millions	% of total	$ millions	% of total
Alberta	21,684	84.7	10,684	79.6
British Columbia	2,719	10.6	1,912	14.2
New Brunswick	–	0.0	405	3.0
Nova Scotia	1,188	4.6	214	1.6
Saskatchewan	4	0	210	1.6

Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online).*

International Natural Gas Exports by Province
($ billions)



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online).*

65.2%

DECLINE IN THE VALUE OF ALBERTA'S NATURAL GAS EXPORTS SINCE 2005

Natural Gas

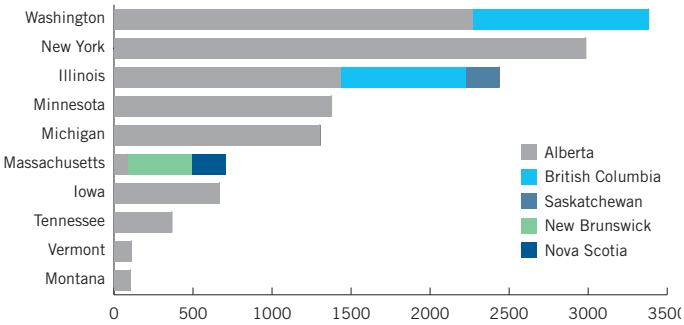
EXPORTS BY DESTINATION

Because Canada does not have any facilities in place to liquefy natural gas for shipment overseas, western Canadian gas producers are entirely reliant on the United States as an export market. BC exports natural gas exclusively to two states: Washington and Illinois. Washington accounted for 58.4% of BC's $1.9 billion in gas exports in 2011, and Illinois the remaining 41.6%. Saskatchewan's $210 million in gas exports in 2011 also went to Illinois.

For their part, Alberta's exports of natural gas within the US are relatively geographically diverse. Alberta's two largest export destinations in 2011 were New York State and Washington State. Exports to those states totalled $3.0 billion and $2.3 billion, respectively, and together accounted for just under half of the total value of Alberta's natural gas exports that year. Other important markets for Alberta natural gas include Illinois, Minnesota, Michigan and Tennessee.

All exports from Canada's other two natural gas-exporting provinces, New Brunswick and Nova Scotia, went to Massachusetts.

Canadian International Natural Gas Exports by Destination 2011 ($ millions)



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

100%

OF WESTERN CANADA'S INTERNATIONAL NATURAL GAS EXPORTS GO TO THE US

Top Export Destinations for Natural Gas 2011

Alberta

	Value	% of exports	
	$ millions	of natural gas	of all products
New York	2,983	27.9	3.2
Washington	2,265	21.2	2.4
Illinois	1,431	13.4	1.5
Minnesota	1,376	12.9	1.5
Michigan	1,303	12.2	1.4
Other US	1,326	12.4	1.4
Other countries	0.0	0.0	0.0

British Columbia

	Value	% of exports	
	$ millions	of natural gas	of all products
Washington	1,116	58.4	3.4
Illinois	795	41.6	2.4
Other US	0.0	0.0	0.0
Other countries	0.0	0.0	0.0

Saskatchewan

	Value	% of exports	
	$ millions	of natural gas	of all products
Illinois	210	100.0	0.7
Other US	0.0	0.0	0.0
Other countries	0.0	0.0	0.0

Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

Natural Gas Liquids

DISTRIBUTION & EXPORTS

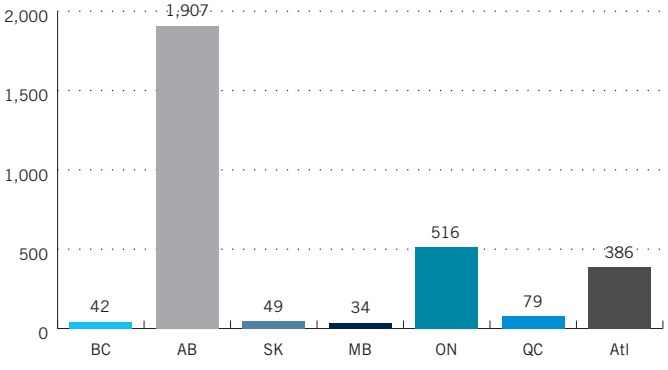
Unlike crude oil and natural gas, most of the natural gas liquids produced in western Canada (mostly propanes, butanes, and ethanes) are also consumed in the region or shipped to other provinces. In 2009, the most recent year for which comparable production and export data are available, exports of NGLs were equivalent to only about 13.1% of regional output. About 26.1% of total production was sold in other provinces and the remainder was consumed within the region. Alberta and Saskatchewan also imported small volumes of NGLs that year.

As with most other fossil fuels, western Canada accounts for most of the country's international NGL exports. However, NGL exports from outside the West have expanded considerably over the past 15 years, especially from Ontario and New Brunswick. In total, Canadian NGL exports were valued at $3.0 billion in 2011, two thirds of which came from the western provinces. By comparison, the West accounted for 91.0% of NGL exports in 1996.

As western Canada's dominant producer of NGLs, Alberta is also the region's largest exporter of those products. Of the $2.0 billion in NGL exports from the western provinces in 2011, $1.9 billion came from Alberta. The remaining $126 million was relatively evenly distributed across BC ($42 million), Saskatchewan ($49 million) and Manitoba ($34 million).

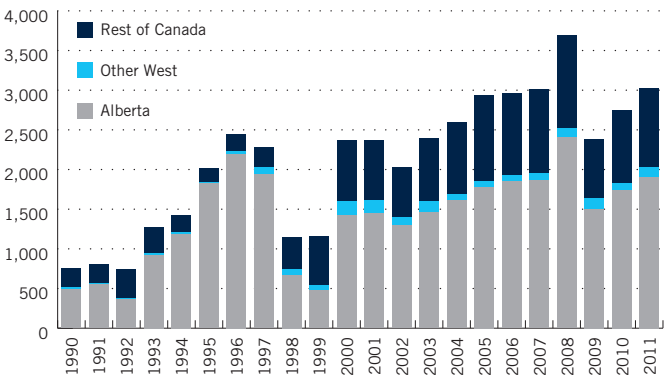
Propane is by far the most important type of NGL exported by the western provinces. For the region as a whole, propane accounted for 70.0% of total NGL exports in 2011 and nearly all NGL exports from Saskatchewan and Manitoba.

International NGL Exports by Province 2011 ($ millions)



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online).*

International NGL Exports by Province ($ millions)



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online).*

International NGL Exports by Province 2001 and 2011 ($ millions)

	Propane		Butanes		Ethylene, Propylene, etc.		Others	
	2001	2011	2001	2011	2001	2011	2001	2011
British Columbia	17.0	36.6	8.6	5.3	–	0.1	0.1	0.0
Alberta	1,141.4	1,311.0	121.3	112.6	87.5	476.6	98.2	6.7
Saskatchewan	69.9	46.7	9.4	2.5	–	0.1	–	0.1
Manitoba	29.6	34.2	27.5	0.2	–	–	0.0	–
Ontario	529.0	383.3	23.6	9.7	54.9	55.7	2.4	67.6
Quebec	28.9	37.4	2.9	24.5	11.5	16.6	4.9	0.2
Atlantic	12.1	36.1	0.4	7.4	86.9	342.2	0.3	–

Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online).*

Natural Gas Liquids

EXPORTS BY DESTINATION

As with crude oil and natural gas, western Canadian exports of NGLs are sold almost exclusively in the US market. The relative importance of export destinations within the US vary from province to province, but Alberta so dominates total NGL exports from western Canada that its major customers in the US are necessarily the most important customers for western Canada as a whole.

For Alberta, most shipments of NGLs into the US go to five specific markets: Texas, Michigan, North Dakota, Illinois and Washington. Those states accounted for 67.4% of Alberta's total NGL exports in 2011 and 65.3% of NGL exports from the four western provinces combined.

In Saskatchewan and Manitoba, NGL exports are largely delivered to neighbouring or nearby states. Wisconsin, North Dakota and Minnesota are Saskatchewan's largest export destinations for NGLs, accounting for 54.6% of provincial NGL exports in 2011. For its part, Manitoba sent 70.0% of its NGL exports to those same states that year.

In BC, NGL exports are dominated by a single market, Washington, which made up more than half of NGL exports in 2011.

Top International Export Destinations for NGLs 2011

Alberta

	Value	% of exports
	$ millions	of NGLs
Texas	455.7	23.9
Michigan	374.7	19.6
North Dakota	198.7	10.4
Illinois	135.5	7.1
Washington	121.2	6.4
Other US	621.1	32.6
Other countries	0.0	0.0

British Columbia

	Value	% of exports
	$ millions	of NGLs
Washington	21.5	51.1
California	6.5	15.4
Arizona	5.9	14.0
Idaho	4.1	9.8
Oregon	3.0	7.2
Other US	1.0	2.5
Other countries	0.0	0.0

Saskatchewan

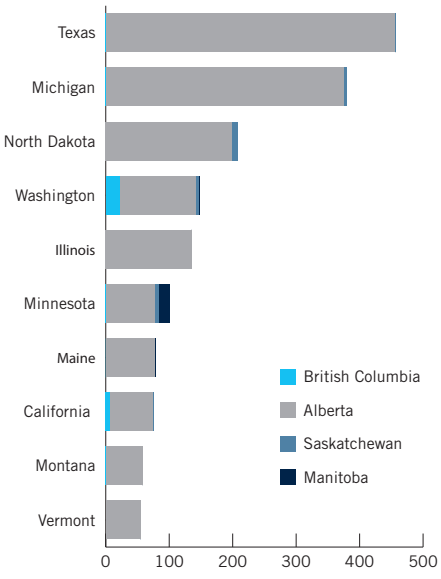
	Value	% of exports
	$ millions	of NGLs
Wisconsin	12.1	24.7
North Dakota	8.8	17.8
Minnesota	6.0	12.2
New Hampshire	4.8	9.7
Washington	4.5	9.1
Other US	13.1	26.5
Other countries	0.0	0.0

Manitoba

	Value	% of exports
	$ millions	of NGLs
Minnesota	17.0	49.4
Wisconsin	5.8	16.8
Arizona	2.5	7.4
Washington	1.7	4.9
Maryland	1.5	4.2
Other US	5.9	17.3
Other countries	0.0	0.0

Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online).*

International NGL Exports by Major Destination 2010 ($ millions)



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online).*

Electricity

DISPOSITION & TRADE

Canada's electricity transmission network is far more geared to north-south delivery of power than to transporting electricity across provincial borders. Most major transmission lines (exceeding 345 kV) cross the Canada-US border and relatively few link one province to another.

Manitoba is the only province in western Canada that produces a significant surplus of power for sale in other markets. Outside of the region, Quebec, Ontario and Newfoundland and Labrador are all net exporters (including to other provinces). In the case of Newfoundland and Labrador, its surplus electricity is sent to Quebec, since it has no direct transmission capacity in to the US.

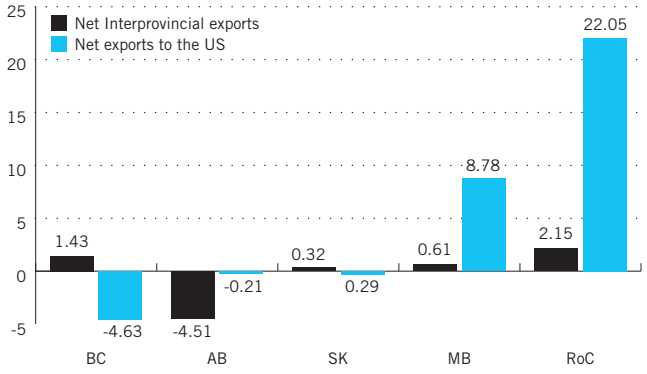
While Manitoba is the largest net exporter of electricity in western Canada, BC is the region's most active trader in energy markets. It was the only province in Canada to both export and import significant amounts of electric power in 2010. The total quantity of electricity traded by BC with other provinces and with the US (exports plus imports) reached 18.3TWh in 2010, compared to 10.1TWh for Manitoba. Trade in Alberta and Saskatchewan was comparatively modest at 6.3TWh and 1.4TWh, respectively.

Electricity Distribution and Trade 2010 (TWh)

	Total generation	Exports		Imports		Total available (within border)
		To other provinces	To the US	From other provinces	From the US	
BC	63.6	1.9	5.7	0.5	10.3	66.8
AB	68.7	0.5	0.3	5.0	0.5	73.4
SK	20.4	0.6	0.1	0.3	0.4	20.4
MB	33.8	0.7	9.1	0.0	0.3	24.4
ON	150.7	11.7	11.2	5.1	3.7	136.6
QC	185.2	7.2	17.0	37.8	2.5	201.3
NB	11.2	1.5	1.0	4.6	0.8	14.2
NS	12.0	0.0	0.0	0.3	0.2	12.4
PE	0.5	0.2	–	1.0	–	1.2
NL	41.7	30.4	–	0.0	–	11.4
Can	589.0	–	44.4	–	18.7	563.3

Source: Statistics Canada Table 127-0008.

Electricity Trade Flows by Province 2010 (TWh)



Source: Canada West Foundation calculations using data from Statistics Canada Table 127-0008.

Electricity

EXPORTS & IMPORTS BY PROVINCE

Compared to other sources of energy, western Canada's international trade in electricity is relatively balanced between exports and imports. In 2011, the region's electricity exports were valued at $643 million, compared to imports of $254 million. Although electricity trade is volatile from one year to the next, western Canada has consistently been a net exporter of electricity to the United States.

On the export side, western Canada's trade in electricity is dominated by BC and Manitoba. Those two provinces together accounted for 99.3% of western Canada's electricity exports in 2011, with total sales valued at $338 million and $300 million, respectively. Exports from Saskatchewan ($3.4 million) and Alberta (less than $1 million) were negligible.

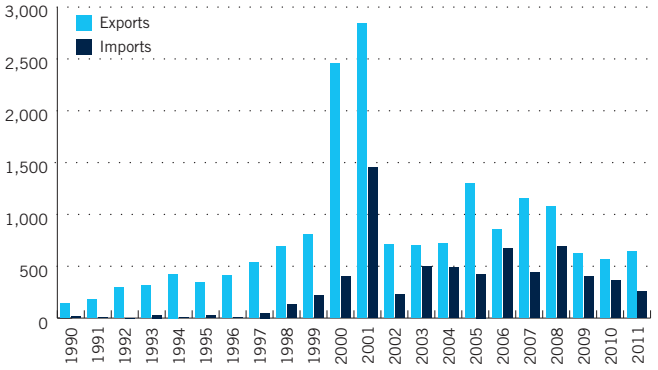
On the import side, BC was by far the largest buyer of electricity in the West, with purchases valued at $212 million in 2011. Electricity imports in other western provinces were comparatively small. At $30 million in 2011, Alberta was the next largest importer of electricity in the region and the largest importer on a net basis. Saskatchewan and Manitoba imported just $8.8 million and $3.3 million each.

With relatively large exports and negligible imports, Manitoba is by far the largest net exporter of electricity in the region—the total of exports minus imports is $297 million. For the first time in four years, BC was also a net electricity exporter in 2011. By contrast, Alberta and Saskatchewan are small net importers.

$297 MILLION

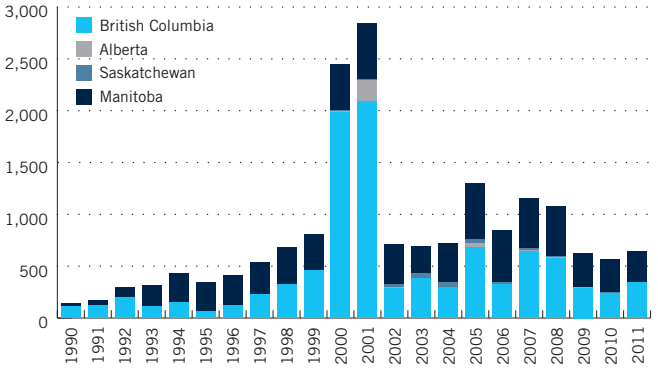
NET INTERNATIONAL ELECTRICITY EXPORTS FROM MANITOBA IN 2011 — THE LARGEST IN WESTERN CANADA

Western Canadian International Trade in Electricity ($M)



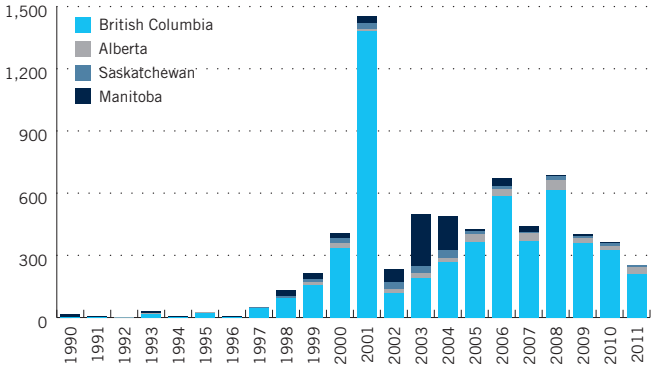
Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

International Electricity Exports by Province ($ millions)



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

International Electricity Imports by Province ($ millions)



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online)*.

Electricity

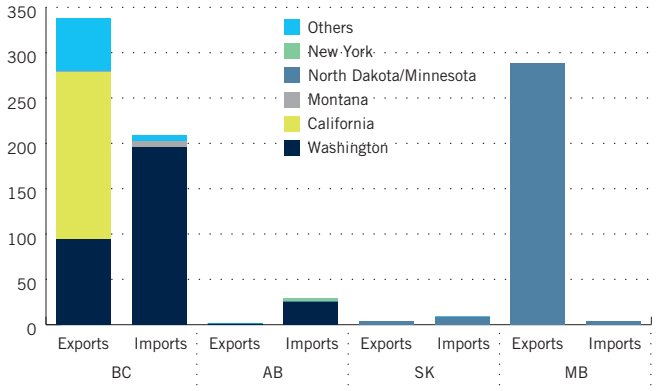
EXPORTS BY DESTINATION

Western Canada's electricity trade with the United States is concentrated in a few key jurisdictions. Manitoba, the region's largest net exporter of electricity, sells exclusively into North Dakota and Minnesota and imports almost all of its electricity from those same states, with small amounts also coming from Indiana in 2011. While the total value of its exports and imports was much smaller, most of Saskatchewan's trade in electricity was with the same states.

For its part, Alberta trades modest quantities of electricity with a range of states, but Washington State accounts for the lion's share of Alberta's electricity exports (93.7%) and imports (87.7%) in 2011.

By contrast, BC trades in electricity with a comparatively large number of US states, although the bulk of that trade is with Washington State, California and Oregon. Those three states accounted for 90.1% of BC's exports of electricity in 2011 and, along with Montana, supplied 99.1% of BC's electricity imports that year.

Western Canadian Electricity Trade with US States 2011 ($ millions)



Source: National Energy Board, *Electricity Imports and Exports.*

Western Canadian Electricity Trade with US States 2011 ($ millions)

	BC		AB		SK		MB	
	Exports	Imports	Exports	Imports	Exports	Imports	Exports	Imports
Washington	94.2	195.5	1.0	24.6	–	–	–	–
California	184.3	0.1	0.0	–	–	–	–	–
Montana	1.4	6.4	–	0.2	–	–	–	–
North Dakota/Minnesota	–	–	0.1	0.8	3.4	8.5	288.8	3.6
Others	57.4	7.1	0.0	3.6	0.0	0.1	–	0.2
TOTAL	**337.3**	**209.1**	**1.1**	**29.2**	**3.5**	**8.6**	**288.8**	**3.8**

Source: National Energy Board, *Electricity Imports and Exports.*

Coal

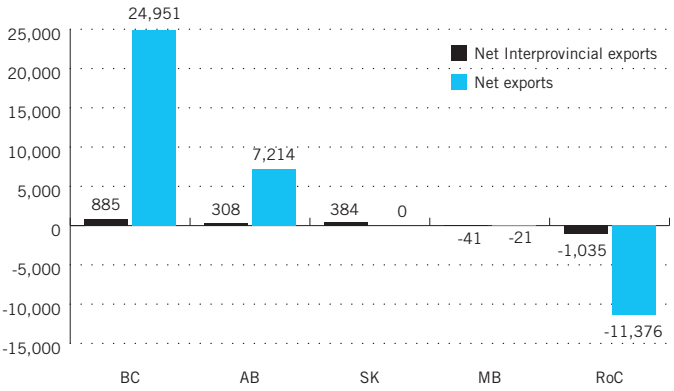
DISPOSITION & TRADE

While the three westernmost provinces account for nearly all coal produced in Canada, the nature of that coal, and therefore its disposition, vary considerably. BC, which is one of the world's leading suppliers of metallurgical coal, produces it almost exclusively for the export market. In 2010, 93.0% of BC coal was shipped abroad.

By contrast, Alberta and Saskatchewan produce thermal coal which is primarily used in domestic applications such as electricity generation. As such, Alberta and Saskatchewan export only a small share of their overall coal production. In Alberta, 22.6% of coal produced in 2010 was sold in international markets, while in Saskatchewan, coal exports were negligible. East of Saskatchewan, Canada is a net importer of coal.

Relative to international trade, there is little interprovincial trade in coal. While the western provinces do sell some coal in Ontario and, to a lesser extent, Quebec, eastern provinces generally meet their coal requirements via imports from West Virginia, Pennsylvania and other nearby US states.

Coal Trade Flows by Province 2010 (kilotonnes)



Source: Canada West Foundation calculations using data from Statistics Canada Table 128-0017.

Coal Supply and Disposition 2010 (kilotonnes)

	Production	Exports	Imports	Net interprovincial exports	Other adjustments	Total available
British Columbia	26,821	24,951	–	885	804	1,789
Alberta	31,889	7,222	7	308	271	24,638
Saskatchewan	10,264	–	–	384	–	9,880
Manitoba	–	–	21	-41	–	61
Ontario	–	–	9,570	-858	–	10,428
Quebec	–	–	621	-178	–	799
New Brunswick	–	–	796	–	–	796
Nova Scotia	–	–	388	–	-501	889
Prince Edward Island	–	–	–	–	–	–
Newfoundland & Labrador	–	–		–	–	
Canada	68,974	32,173	11,404	–	1,076	49,281

Source: Statistics Canada Table 128-0017.

Coal

EXPORTS BY PROVINCE

BC accounts for the vast majority of Canadian coal exports with Alberta making up most of what remains. In 2011, the value of coal exported from Canada was just over $8.0 billion. Of that total, $7.1 billion (89.1%) came from BC, with $870 million (10.9%) from Alberta.

The value of coal exports from BC has surged in recent years on the strength of overseas demand for metallurgical coal in steel manufacturing, particularly in China and other Asia-Pacific markets. While overall coal production in BC has remained flat over the past 20 years, metallurgical coal prices have soared since 2007, raising the value of BC's coal exports. Provincial coal exports rose by 351% from 2004 to 2011. In 2008, coal passed lumber to become BC's most important export product. By 2011, coal accounted for 21.5% of BC's total exports worldwide.

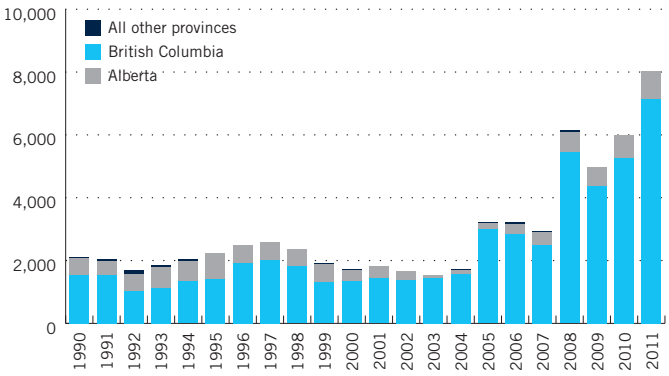
Exports of coal from Alberta have also seen strong growth in recent years, offsetting a sharp decline from 1995 through 2003. Only in 2011 did Alberta's coal exports finally exceed 1995 levels.

For its part, Saskatchewan is a small and sporadic coal exporter. It did not sell any of the mineral abroad in 2009 or 2011, but recorded modest exports in 2007 and 2008.

COAL IS BC'S MOST VALUABLE EXPORT PRODUCT. ITS SHARE OF TOTAL EXPORTS IN 2011:

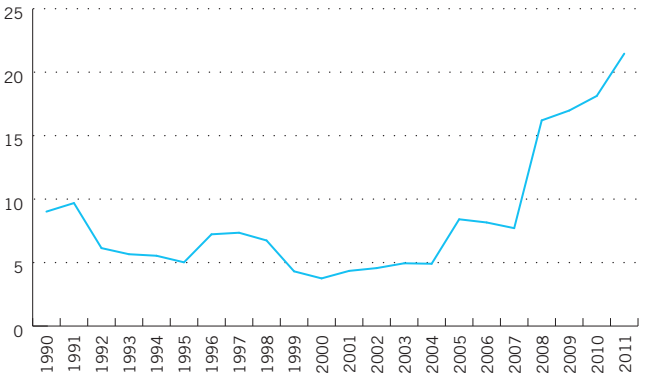
21.5%

International Coal Exports by Province ($ millions)



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online).*

BC Coal Exports as a % of Total BC International Exports



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online).*

Coal Exports by Province

	2001		2011	
	$ millions	% of total	$ millions	% of total
British Columbia	1,430.6	78.4	7,140.9	89.1
Alberta	392.4	21.5	869.7	10.9
Ontario	1.4	0.1	0.0	0.0
Quebec	0.0	0.0	0.0	0.0
Saskatchewan	0.1	0.0	–	–
Others	–	–	–	–

Source: Statistics Canada *(Trade Data Online).*

Coal

EXPORTS BY DESTINATION

Most of western Canada's coal exports are shipped to Asian markets for steel production. Japan and South Korea alone accounted for 50.9% of coal exports from BC and 51.8% of coal shipments from Alberta in 2011.

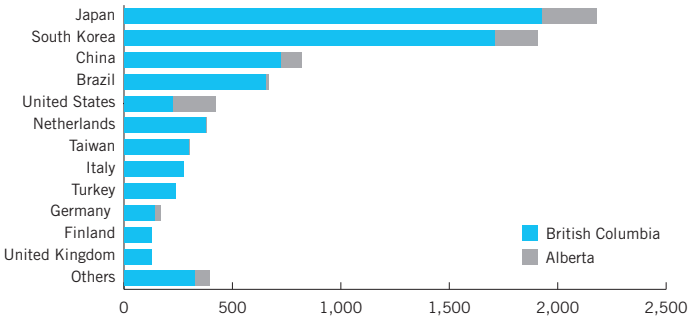
However, China is growing rapidly in importance as a destination for coal exports from both provinces. BC did not sell any coal in China in 2002, but nine years later sales had reached $721 million and China had become the third largest international destination for BC coal. Similarly, Alberta did not export any coal to China as recently as 2005, but by 2011, China had become Alberta's fourth most important market for coal for steel production.

For Alberta, most coal not exported to Japan, South Korea or China goes to the United States. By contrast, BC exports to a variety of destinations around the world. European Union economies bought about 15.6% of BC coal exports in 2011, while Brazil made up 9.2% of exports. Taiwan and Turkey accounted for 4.2% and 3.3% of BC's coal exports, respectively.

94.7%

OF WESTERN CANADA'S INTERNATIONAL COAL EXPORTS GO TO NON-US DESTINATIONS

International Coal Exports from Western Canada by Destination 2011 ($ millions)



Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online).*

Top International Export Destinations for Coal 2011

Alberta

	$ millions	% of coal exports
Japan	251	28.9
South Korea	199	22.9
United States	197	22.6
China	100	11.5
Slovakia	47	5.3
Other countries	77	8.8

British Columbia

	$ millions	% of coal exports
Japan	1,927	27.0
South Korea	1,707	23.9
China	721	10.1
Brazil	653	9.2
Netherlands	378	5.3
Others	1,747	24.5

Source: Canada West Foundation calculations using Statistics Canada data *(Trade Data Online).*

Conclusion

Risks and Opportunities

Western Canadian exporters have benefited enormously from easy access to the world's largest energy consumer. The vast majority of the $88.9 billion in energy exports from the region in 2011 went to the United States, accounting for nearly half of all the primary energy produced in the western provinces. While US demand has been an important catalyst for the development of western Canadian energy resources, it has been suggested that the region is over-reliant on US energy consumers and needs to diversify its markets.

There are a number of reasons why market diversification of energy exports would be a good policy objective for the western provinces. The overarching theme for the diversification objective is energy security. While in the United States energy security refers to security of supply, in western Canada, where supply is abundant, energy security refers primarily to security of demand. For the West to continue to produce energy at its present rate or to expand production, it needs to have access to markets that will commit to buying that energy.

However, the long-term outlook for energy consumption in the United States is for only modest growth and is dwarfed by expected growth in energy demand in rapidly-emerging Asian markets, most notably China. In addition, political and economic developments in the US have cast a shadow of uncertainty on western Canada's long-term growth prospects for energy trade in that market. On the one hand, the US Administration has long wished to reduce its reliance on foreign oil, especially from unstable overseas regimes. To the extent that this policy reflects a desire for North American energy independence, it represents a positive force in the outlook for western Canadian energy production; while overall US demand may not grow significantly in the years ahead, there are opportunities for western Canadians to increase their market share, displacing oil imported from overseas. On the other hand, bitumen produced from the oil sands is facing growing resistance within the US and the potential development of shale oil deposits in the US could help that country increase its capacity to meet crude oil demand with domestic supply. The extent to which these competing forces affect US demand for western Canadian oil in the future is uncertain.

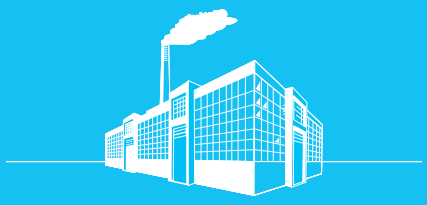
Another factor in the long-term energy trade relationship between Canada and the US is the rapid development of shale gas and other unconventional gas sources in the US. As these reserves are brought online, demand for western Canadian natural gas could be displaced in the US market. Reduced demand for Canadian natural gas would affect not only production in existing gas plays in western Canada, but could also affect the development of the region's own unconventional reserves; without the US market as a customer base, it would be more difficult to make an economic case for investment in western Canadian unconventional gas plays.

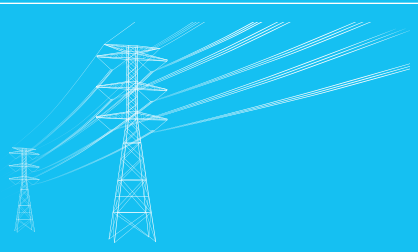
At the same time as western Canadians face uncertain demand prospects, there is also growing interest from China, South Korea and other Asia-Pacific countries in the West's energy resources. The main challenge is that western Canadians cannot take advantage of soaring energy demand in that part of the world because there is presently only very limited capacity to ship western Canadian oil overseas and no capacity to ship natural gas. Proposals are in place to build the necessary pipelines and other infrastructure to tap into Asian demand for western Canadian energy, but these projects will take years to navigate the regulatory approval process and to complete stakeholder consultations, planning and construction. Moreover, they face stiff resistance from various environmental and First Nations groups.

ENERGY AS AN INPUT

95.5%
of coal use in western Canada is for electricity generation

30.3%
of refined petroleum available in Alberta is used to fuel refineries





8.5%
of western Canadian natural gas is used to generate electricity

84.9%
of the region's natural gas liquids are used to produce non-energy goods

Introduction

The total amount of energy that is available for use in each of the four western provinces is equal to the amount (of each type) produced in those provinces, less net international and interprovincial trade flows, and other adjustments and transfers. However, there is an important distinction to be made between energy used as an input into other processes and direct energy *consumption* (also known as "final demand") in each province.

As with any energy system around the world, not all available energy in western Canada is consumed by final end-users. Some is used as an input into the energy-production process; some is used for non-energy purposes and some is refined or otherwise converted to a more useable form. In all three cases, the net effect is that some available energy is withdrawn from the overall energy system before it reaches consumers.

For these reasons, it is important to distinguish between energy availability in western Canada and the final demand of end users. In a sense, the use of energy as an input into other processes represents an intermediate step between production, distribution and trade on the one hand, and energy demand on the other. In this discussion, "energy use" refers to what we do with our raw supply of energy (after accounting for imports and exports) – including its use as an input – while "energy consumption" refers to the disposition of final energy products and the spending patterns of end users in the energy system.

Of the three input uses for energy listed above, the largest is the process of converting raw energy into final energy products. Not all available energy is in a form that is easily used by final consumers. Coal, for example, has some industrial utility, but limited direct consumer application; most of western Canada's coal is converted to electricity or used in metallurgical applications. Similarly, crude oil is refined into more specific fuel types – like gasoline, diesel or aviation fuel – before it is consumed.

Electricity generation and refining are critical intermediary steps between the production of raw energy and the consumption of final energy products. However, these processes inevitably result in the loss of some energy from the overall energy system because no generating plant or refinery is even close to perfectly efficient. In the case of coal-fired electricity plants, for example, between half and two-thirds of all heat generated is lost.

In addition to energy conversion from one form to another (and associated energy losses), some energy is also used by producers to operate the facilities involved in those processes. For example, a significant amount of the natural gas and crude oil recovered from oil sands production in Alberta is used as an input to fuel oil sands operations. Similarly, a significant share of the hydroelectric power generated in BC and Manitoba is used to operate those generating facilities.

Finally, some raw energy in western Canada is siphoned off and used to produce non-energy goods, including primary plastics, asphalt, tar and lubricants. In most cases, only a small share of available energy is used for these purposes, with the exception of natural gas liquids, whose primary use in western Canada is in non-energy applications. For obvious reasons, there are no non-energy applications for electricity.

The energy that remains in the system after accounting for non-energy applications; producer use; and conversion to other forms of energy (electricity and refined petroleum products) is then consumed by final end-users. This section looks at the input uses for energy products in western Canada and at how much of the available energy in the region (after trade and other adjustments) reaches final consumers such as industrial firms, transportation fleets, agricultural producers, schools, hospitals, offices, stores and private individuals.

Coal

ENERGY AVAILABILITY & DISPOSITION

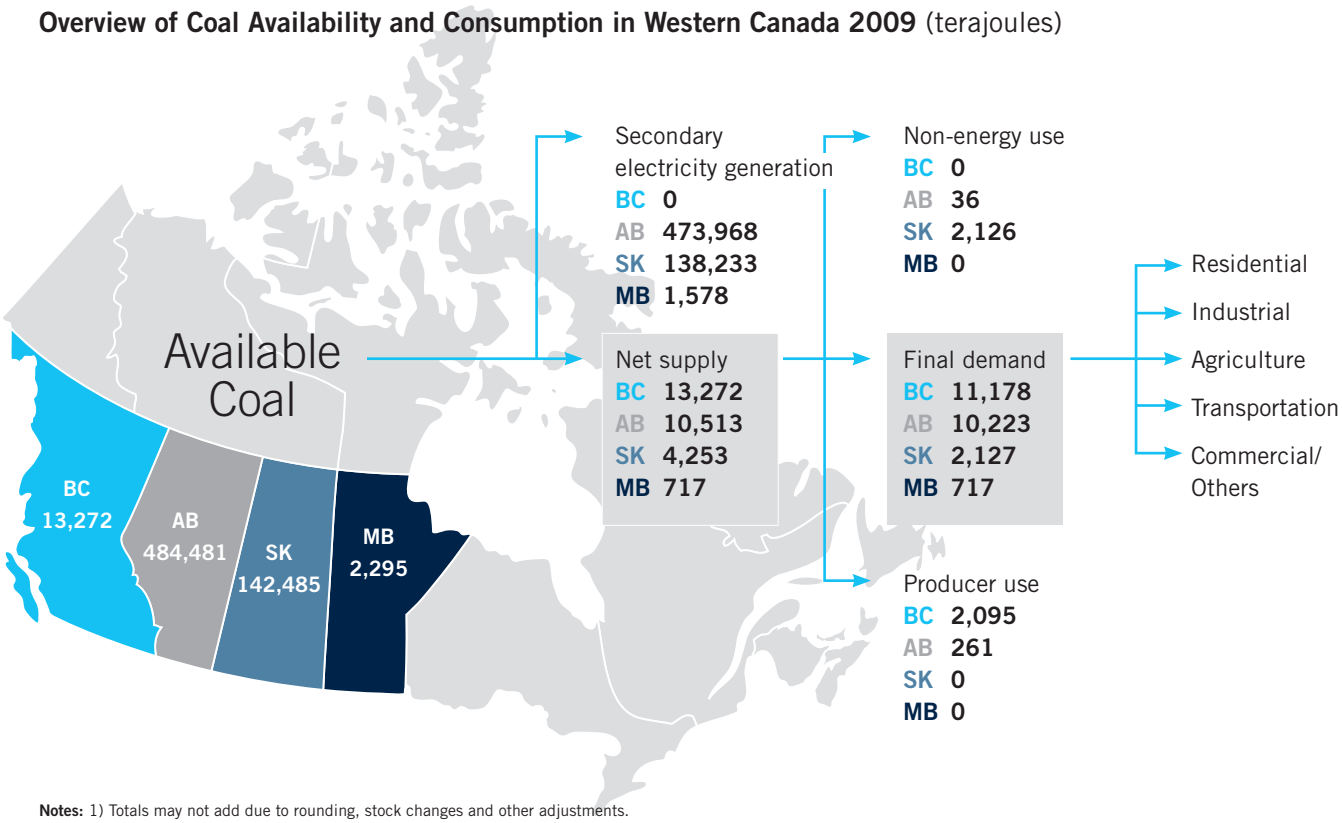
From an energy use standpoint, the vast majority of coal available for use in western Canada is not consumed directly by final energy users, but first is converted to another, more user-friendly form: electricity. In 2009, more than 95.5% of all coal used in western Canada was used for electricity generation.

Alberta and, to a lesser degree, Saskatchewan are particularly heavy users of coal-fired electricity. Alberta alone accounts for nearly half of all coal use across Canada, 97.8% of which is converted to electricity. For its part, Saskatchewan accounts for 14.6% of coal use across Canada, 97.0% of which is used in electrical plants. By comparison, BC and Manitoba are relatively modest users of coal, largely because those provinces rely on hydro and other fuel sources to generate most of their electricity.

After accounting for other transformations, direct consumption by producers[1] and non-energy uses, only 3.8% of all coal available in western Canada is consumed directly by final energy users. Industrial users, including those which employ coal as a fuel source in mining operations, account for almost all final demand for coal in western Canada.

[1] It should be noted that "producer use" refers to energy that producers extract and then immediately consume in the production process. Energy purchased from another party and then consumed by the extractive sector is considered to be final consumption by industrial end-users.

Overview of Coal Availability and Consumption in Western Canada 2009 (terajoules)



Notes: 1) Totals may not add due to rounding, stock changes and other adjustments.
2) Does not include small amounts used for steam generation.
Source: Statistics Canada *Report on Energy Supply and Demand in Canada.*

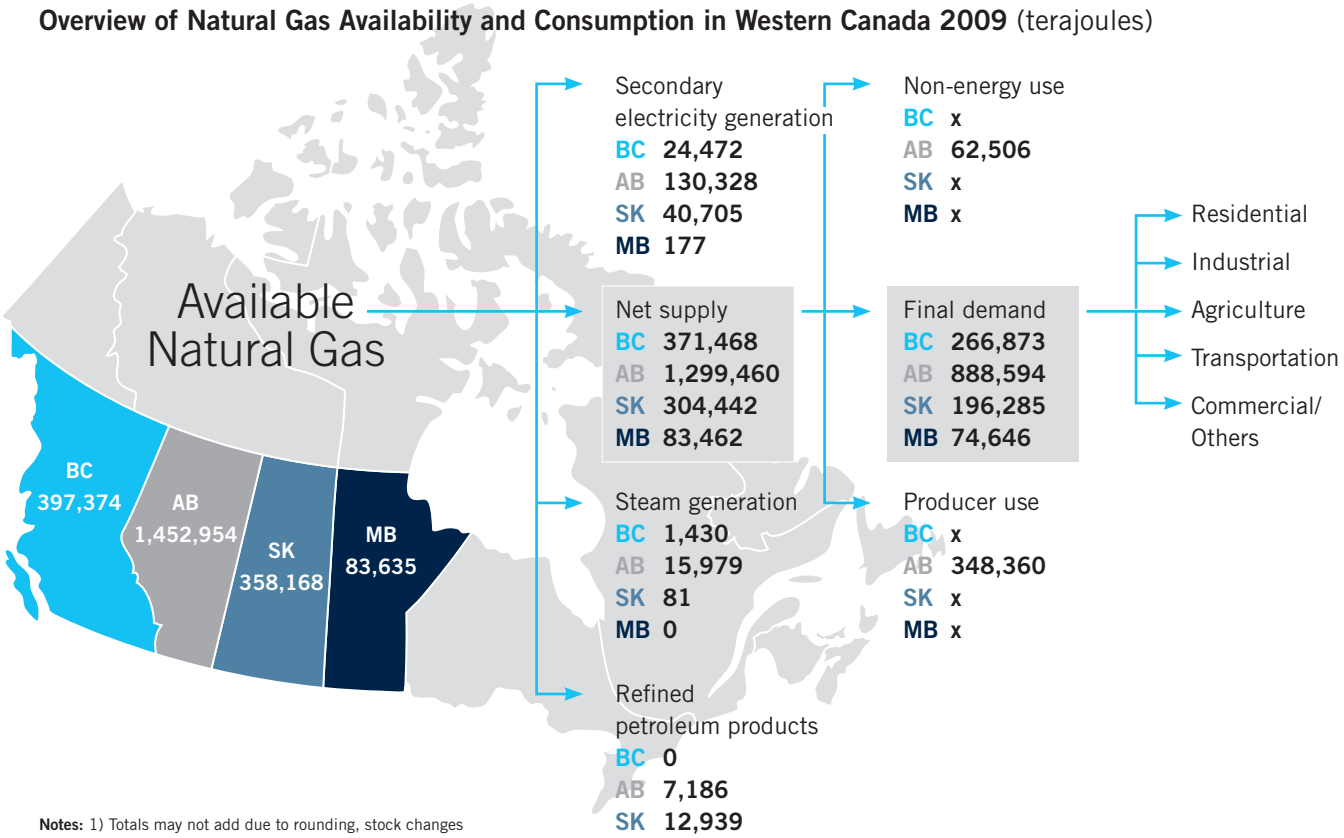
Natural Gas

ENERGY AVAILABILITY & DISPOSITION

Compared to other energy sources, natural gas has a relatively wide range of uses in western Canada. For the region as a whole, about 8.5% of all available natural gas in 2009 was converted to electricity; with additional amounts further refined, or used to generate steam. A significant share was used by producers operationally and a small amount went to non-energy uses. The largest share (62.2%), however, was consumed directly by final users.

However, there are notable differences across the region. In BC, a larger-than-average share of natural gas (67.2% in 2009) is consumed by final end-users, while the remainder is converted to electricity. A significant share of Alberta's available supply in 2009 (24.0%) was consumed directly by oil and gas producers even before it could be made available on the open market. In Saskatchewan, a relatively large share of available gas supply (11.4% in 2009) is used to generate electricity. Saskatchewan is also the largest producer of refined petroleum products from natural gas of any province in Canada. Hydrogen, used in making gasoline and diesel fuel, is created from this natural gas. Finally, in Manitoba, where natural gas is imported from other provinces, the available supply is consumed almost exclusively by final end-users.

Overview of Natural Gas Availability and Consumption in Western Canada 2009 (terajoules)



Notes: 1) Totals may not add due to rounding, stock changes and other adjustments. 2) x=not available.
Source: Statistics Canada *Report on Energy Supply and Demand in Canada.*

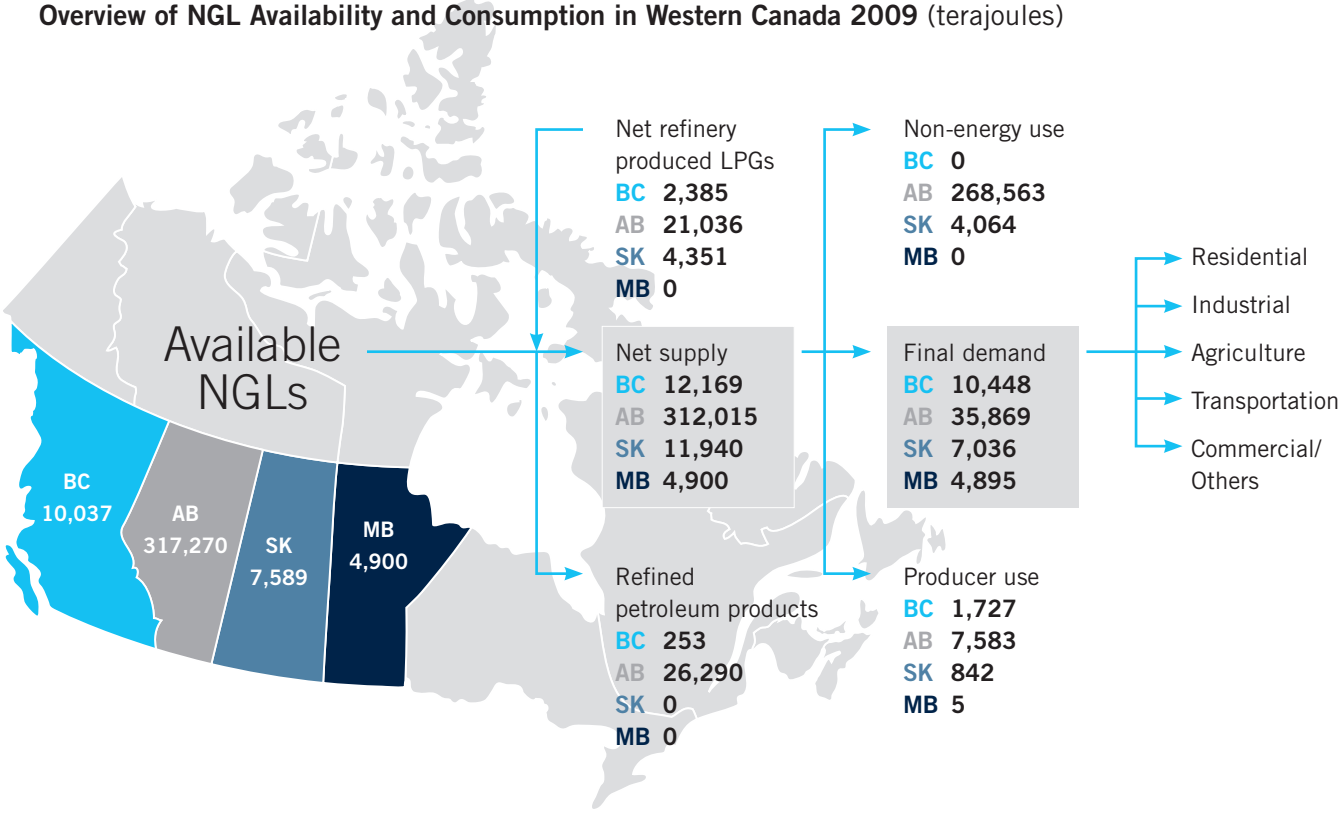
Natural Gas Liquids

ENERGY AVAILABILITY & DISPOSITION

The availability and use of natural gas liquids in western Canada is limited in all provinces except for Alberta. For BC, Saskatchewan and Manitoba, NGLs are a relatively small source of energy compared to primary electricity or natural gas, and essentially all NGLs in those provinces are consumed by final end-users.

In Alberta, by contrast, NGLs are used for a comparatively wide range of purposes. Most of the province's available NGL supply — about 84.6% in 2009— is used for the production of non-energy goods. Specifically, ethanes produced in Alberta are used to create petrochemical feedstocks and other primary forms of plastics which are then manufactured into finished plastics products elsewhere. In addition, a small volume of NGLs in Alberta (about 8.3% of available supply) is refined into other petroleum products. About 2.4% of NGLs are consumed directly by producers operationally, while about 11.3% of the available supply is consumed in the form of final demand products.

Overview of NGL Availability and Consumption in Western Canada 2009 (terajoules)



Notes: 1) Totals may not add due to rounding, stock changes and other adjustments.
2) Does not include small amounts used for steam generation.
3) LPGs are liquefied petroleum gases.
Source: Statistics Canada *Report on Energy Supply and Demand in Canada.*

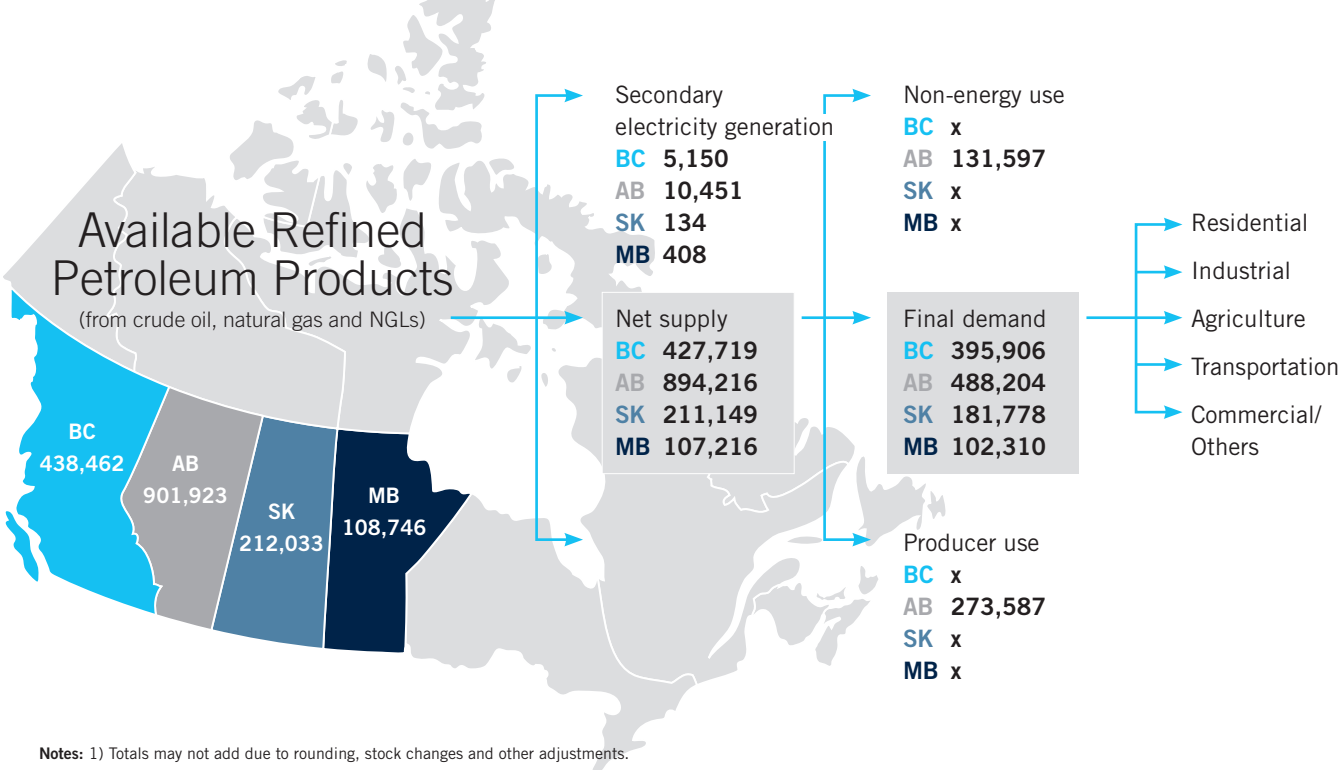
Crude Oil & Refined Petroleum

ENERGY AVAILABILITY & DISPOSITION

All crude oil produced in western Canada and not exported outside the region is refined into useable petroleum products such as gasoline, aviation fuel and diesel fuel oil. In addition, as noted earlier, small amounts of available natural gas and NGLs in the region are also processed into various types of refined petroleum products.

For the most part, these refined petroleum products are intended for final demand use, largely as fuels in vehicle transportation. However, in all four western provinces, a portion of available refined petroleum products is used by producers in the refining process and a portion is used to produce non-energy goods such as asphalt, industrial lubricants and petrochemical feedstock. While data are not available for BC, Saskatchewan and Manitoba, in Alberta about 14.6% of available refined petroleum was used for non-energy purposes, while 30.3% was used in the refining process itself. In all four provinces, a small share of available refined petroleum products is used to generate electricity.

Overview of Crude Oil and Refined Petroleum Availability and Consumption in Western Canada 2009 (terajoules)



Notes: 1) Totals may not add due to rounding, stock changes and other adjustments. 2) Does not include small amounts used for steam generation. 3) x=not available.
Source: Statistics Canada *Report on Energy Supply and Demand in Canada.*

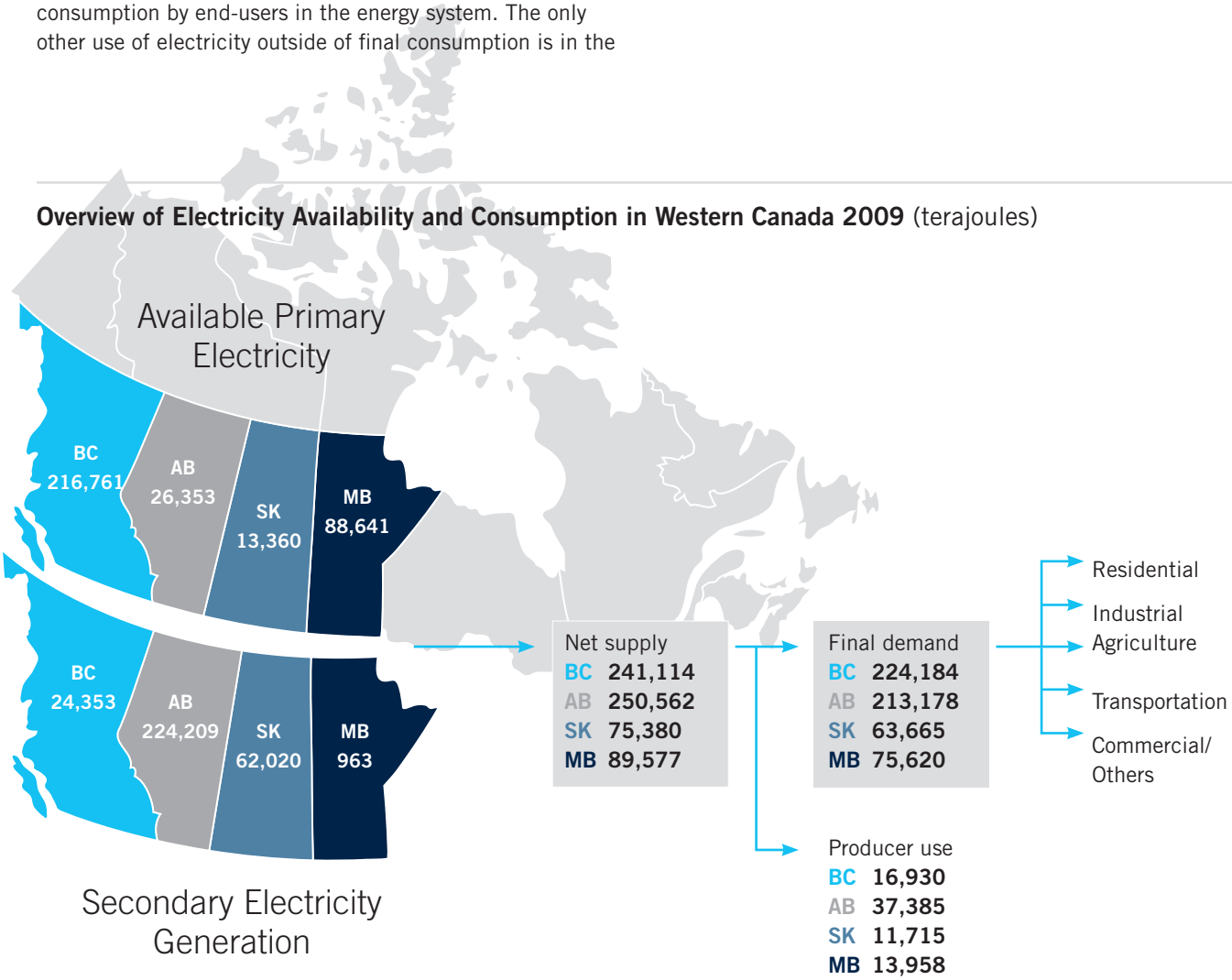
Electricity

ENERGY AVAILABILITY

As noted earlier, the western provinces generate electricity using a range of energy sources. Manitoba produces electricity almost exclusively from hydro power. Hydro also dominates in BC, although that province uses some natural gas-fired plants as well. For its part, Saskatchewan produces electricity from coal- and gas-fired plants, as well as some hydro power, while Alberta generates power almost exclusively by burning coal and natural gas.

All power generated in western Canada is intended for final consumption by end-users in the energy system. The only other use of electricity outside of final consumption is in the operation of the electricity-generating facilities themselves. However, in three of the four western provinces, the total amount of energy consumed by electricity producers exceeds the national average by a considerable margin. Across Canada, an average of 9.8% of electricity was consumed by generating facilities in 2009, while the remainder was available for consumers. This share is noticeably higher in Manitoba (15.6%), Saskatchewan (15.5%) and Alberta (14.9%). Only in BC (7.0%) is the proportion of power used by generating facilities below the national average.

Overview of Electricity Availability and Consumption in Western Canada 2009 (terajoules)



Note: Totals may not add due to rounding, stock changes and other adjustments.
Source: Statistics Canada *Report on Energy Supply and Demand in Canada.*

Conclusion

Risks and Opportunities

The amount of energy available in western Canada that is used as inputs in other processes and the amount which makes its way to final consumers vary considerably by source. Most NGLs and nearly all coal is transformed or removed from the energy system before they reach final end users—coal in the generation of electricity and NGLs in the production of non-energy products.

Use of natural gas and refined petroleum is somewhat different in that they have value both as final demand energy products as well as indirect inputs. In most provinces in the region, natural gas and refined petroleum are primarily consumed by end-users. In Alberta, however, where the amount of energy available is significantly higher than elsewhere in the West, much of the available natural gas is used in electricity generation or as a fuel source in the energy production process. Similarly, a significant share of refined petroleum is also used as an input into energy production, while some is also used for non-energy purposes.

There are a few cases where policy developments and the evolution of fossil fuel production in western Canada could have an impact on the demand for, or the availability of, certain energy types as inputs. One example is the outlook for coal as an input into electricity production. Although most coal produced in western Canada is either exported or used in electricity generation, there may be regulatory constraints on the horizon for coal-fired power generation. In 2010, the federal government announced a target of increasing Canada's reliance on non-emitting sources of electricity to 90% by 2020 (from the present level of about 75%). While the language surrounding that objective has been softened to include "low emitting sources," this target would have a disproportionately heavy impact on western Canada, especially Alberta and Saskatchewan where coal is a common input in electricity generation.

Draft regulations regarding coal-fired power plants were published by the federal government in August 2011. These regulations would require all new units built after 2015 and all units approaching the end of their current useful life to match the emissions intensity of natural gas combined cycle power plants. While final regulations have not yet been published, the federal government in January 2012 hinted at a more flexible approach to these emissions standards that would allow provinces to meet overall emissions targets, rather than adhering to unit-by-unit standards.

Regardless of the form these regulations will take, there are implications for electricity supply and distribution, not to mention consumer prices, in the West. This is especially true in Alberta, where coal remains an important electricity feedstock.

At the same time, the need to replace existing capacity with new low-emission power technology opens up a number of opportunities for the western provinces. For one, new regulations could mandate the adoption of lower-emission power generation technologies such as integrated gasification combined cycle (IGCC) plants, high-efficiency natural gas facilities, nuclear, wind, hydro and solar power and carbon capture and sequestration.

Another potential issue is the availability of natural gas liquids in the development of a primary plastics industry in western Canada, or for that matter, the production of other non-energy goods. As noted earlier, the long-term outlook is for declining production of natural gas liquids in western Canada. Since about 80% of available NGLs in western Canada are used in non-energy applications, the declining outlook for production could limit growth in the petrochemical feedstock industry, or alternatively, would require increased imports of NGLs into the West.

FINAL DEMAND & END-USE ENERGY CONSUMPTION

42.7%
of Canadian energy consumption takes place in the West

Per capita energy
consumption is falling in BC and Manitoba, but rising in Alberta and Saskatchewan

British Columbia
has seen one of the largest decreases in per capita energy consumption in the country

Alberta and Saskatchewan are the largest per capita energy-consuming provinces

Natural gas, refined petroleum and electricity account for 97% of energy consumed in western Canada

Introduction

All energy which remains in western Canada after trade, inventory adjustments, refining, conversion to electricity and all other input uses is considered to be available for consumption (also known as "final demand") by end-users.

There are two ways to view energy consumption patterns in western Canada: from the perspective of the type of energy consumed; and from the perspective of major consuming sectors. Both are examined here.

Of the two perspectives, energy consumption by sector is the more complex. Sectoral energy consumption is typically divided into six broad categories: industrial, residential, transportation, agriculture, commercial and other institutional, and public administration.[1] In each category, an analysis is possible of total energy consumption and sectoral demand trends, as well as consumption by type of energy. In some cases, information is available on energy prices and specific factors affecting energy demand.

By contrast, analysis of energy consumption by type of energy is relatively straightforward. There are three main types of energy consumed by final end users: electricity, natural gas and refined petroleum products (gasoline, diesel, etc.). These three categories account for 97% of all energy consumption in western Canada. In each case, information is available to analyze overall final demand by energy type, consumption trends and use by major consuming sector. Because coal and natural gas liquids make up such a small share of final energy consumption in western Canada, they are not included in this analysis.

As with most other aspects of the energy system in western Canada, there is a dichotomy in consumption patterns in the region. On the one side sit Alberta and Saskatchewan which are by far the two largest energy-consuming provinces in Canada (on a per capita basis) and have a unique energy demand structure, heavily influenced by the needs of energy producers and of other extractive industries. In effect, Alberta and Saskatchewan consume extra energy in order to provide consumers across North America (for fossil fuels) and the world (for uranium) with the energy they need.

On the other side are BC and Manitoba, where energy consumption patterns are similar to those in the rest of Canada.

[1] In this report, energy consumption by the commercial and institutional sector and the public administration sector are combined into one category.

Overview

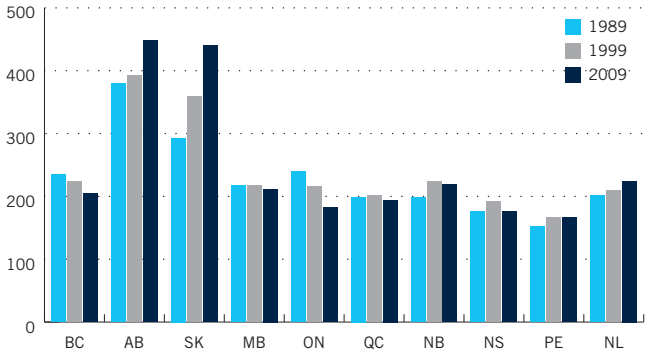
ENERGY CONSUMPTION BY PROVINCE

As a result of being major producers of energy, western Canadians are also large consumers. In 2009, the four western provinces accounted for approximately 30.8% of Canada's population, but consumed 42.7% of the country's primary and secondary energy.

This relatively high share of consumption in western Canada is because of disproportionately high energy use in Alberta and Saskatchewan. On a per capita basis, Alberta and Saskatchewan are by far the largest energy-consuming provinces in Canada.

Moreover, while per capita energy consumption has fallen in most provinces since the late 1990s, it has grown in Alberta and Saskatchewan. Newfoundland and Labrador—Canada's third largest oil-producing province—is the only other province where per capita energy use has risen since 1999.

Energy Consumption by Province (GJ per capita)



Note: Energy consumption does not include producer use and non-energy uses.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Energy Consumption (Final Demand) by Province 2009

	Total consumption			Per capita consumption		
	terajoules	% of total	% growth: 1999-2009	GJ/capita	% of national average	% growth: 1999-2009
British Columbia	910,372	11.9	1.8	204.1	90.0	-8.5
Alberta	1,645,111	21.5	41.8	448.2	197.6	14.1
Saskatchewan	452,425	5.9	24.3	439.6	193.8	22.5
Manitoba	258,189	3.4	3.9	211.7	93.3	-2.7
Ontario	2,373,863	31.0	-4.6	181.7	80.1	-16.0
Quebec	1,520,243	19.9	3.2	194.2	85.6	-3.5
New Brunswick	163,770	2.1	-2.5	218.6	96.3	-2.4
Nova Scotia	164,822	2.2	-8.0	175.5	77.4	-8.5
Prince Edward Island	23,539	0.3	3.4	166.8	73.5	-0.1
Newfoundland & Labrador	114,043	1.5	2.4	224.4	98.9	7.4
Canada	7,649,786	100	7.3	226.9	100	-3.3

Note: Energy consumption does not include producer use and non-energy uses. "Producer use" refers to energy that producers extract and then immediately consume in the production process.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Overview

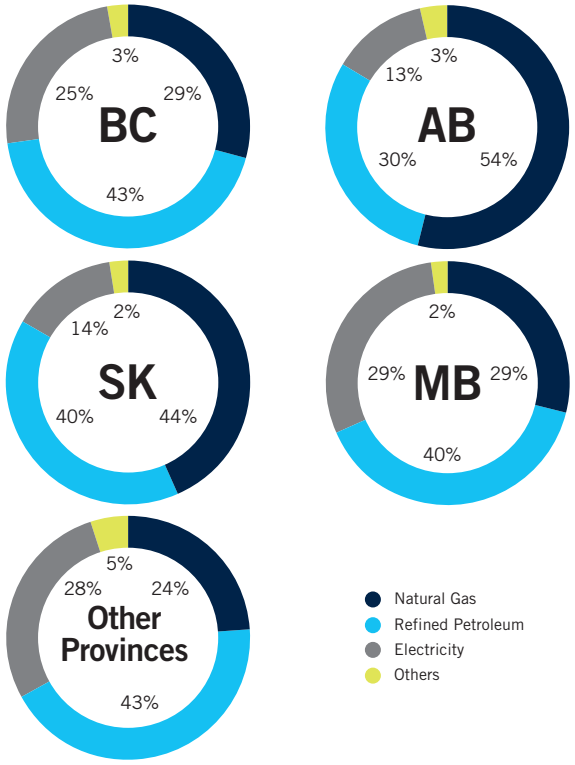
ENERGY CONSUMPTION BY TYPE OF ENERGY

Natural gas, electricity and refined petroleum products are the dominant forms of energy consumed, not only in western Canada, but across the country. All told, these energy sources account for more than 97% of energy consumption in the West and about 96% of consumption nationally. Most coal in western Canada is used to generate electricity and most natural gas liquids are siphoned off for non-energy uses.

However, there are considerable differences in the relative importance of natural gas, electricity and refined petroleum to energy consumers across Canada. These differences largely reflect regional resource endowments and transportation linkages. In general, the four western provinces, along with Ontario, consume a relatively large share of natural gas compared to other sources of energy. Quebec is by far the largest consumer of electricity and the Atlantic provinces are large users of refined petroleum products.

Within western Canada, the differences are greater still. Natural gas is by far the largest type of energy used in Alberta and Saskatchewan, while in BC and Manitoba, consumption is relatively evenly divided across the three main forms of consumable energy.

Distribution of Energy Consumption by Fuel Type 2009



Note: "Other" includes natural gas liquids, coal, coke, coke oven gas and steam.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand.*

Total Energy Consumption (Final Demand) by Type 2009 (terajoules)

	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	Canada
Natural gas	266,873	888,594	196,285	74,646	823,605	205,116	20,994	4,911	–	192	2,484,134
Refined petroleum	395,906	488,204	181,778	102,310	959,406	626,144	85,866	114,208	18,317	78,195	3,066,018
Coal	11,178	10,223	2,127	717	9,324	15,597	6	495	–	–	49,667
Natural gas liquids	10,448	35,869	7,036	4,895	38,479	11,881	2,971	4,156	377	1,088	117,884
Electricity	224,184	213,178	63,665	75,620	448,865	657,406	48,274	40,000	4,845	32,209	1,812,369
Others	1,784	9,043	1,534	–	94,185	4,099	5,659	1,052	–	2,358	119,714
TOTAL	**910,373**	**1,645,111**	**452,425**	**258,188**	**2,373,864**	**1,520,243**	**163,770**	**164,822**	**23,539**	**114,042**	**7,649,786**

Notes: 1) Figures for electricity consumption include electricity generated through the burning of coal, natural gas and other fossil fuels.
2) "Others" includes NGLs, direct coal consumption, steam, coke and coke oven gas. 3) Totals may not add up due to rounding.
Source: Statistics Canada *Report on Energy Supply and Demand.*

Overview

ENERGY CONSUMPTION BY SECTOR

The transportation, industrial and commercial sectors are the largest consumers of energy, accounting for about 81.2% of all energy use in western Canada in 2009. For most provinces, the transportation sector, which includes motor vehicles, aircraft, trains, ships and pipelines, is the largest energy user of the three.

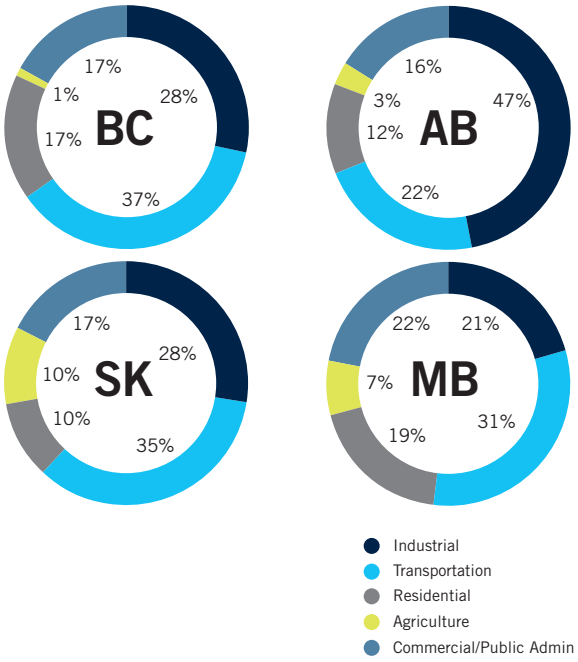
Alberta is a notable exception to this general trend. Industrial energy consumption in Alberta, represents just under half the province's total energy use.

Agriculture is a relatively large energy consumer in both Saskatchewan and Manitoba at 10% and 7% of provincial energy consumption, respectively.

34%

ALBERTA'S SHARE OF NATIONAL INDUSTRIAL ENERGY CONSUMPTION

Distribution of Energy Consumption by Sector 2009



Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand.*

Total Energy Consumption (Final Demand) by Sector 2009 (terajoules)

	BC	AB	SK	MB	ON	QC	NB	NS	PE	NL	Canada
Industrial	259,550	769,533	124,264	53,245	499,096	436,711	49,683	23,539	1,830	20,733	2,244,700
Transportation	334,850	364,481	156,437	81,130	810,070	469,952	52,560	62,382	9,773	49,776	2,396,343
Agriculture	9,536	44,218	46,759	18,495	41,943	21,081	2,411	3,314	1,644	368	190,024
Residential	153,705	204,886	46,817	49,234	504,741	277,186	26,841	28,996	4,083	17,052	1,316,207
Public Admin	11,215	15,693	8,716	5,105	19,689	38,772	4,908	7,995	509	6,964	121,793
Commercial/other	141,505	246,304	69,447	50,983	498,319	276,544	27,356	38,594	5,701	19,156	1,380,721
TOTAL	**910,372**	**1,645,111**	**452,425**	**258,189**	**2,373,858**	**1,520,246**	**163,759**	**164,820**	**23,540**	**114,049**	**7,649,786**

Notes: 1) Totals may not add up due to rounding.
2) Consumption of energy products does not include producer use and non-energy uses.
Source: Statistics Canada *Report on Energy Supply and Demand.*

Energy Consumption by Sector

210 GJ

Per capita industrial energy consumption in Alberta in 2009 – three times the national average

0.77

The number of registered vehicles per person in Alberta and Saskatchewan – the highest share in Canada

24.6%

of Canadian energy consumption in agriculture takes place in Saskatchewan

57.8%

of residential energy consumption in Manitoba is electricity – the highest share in the West

113.9%

The amount by which Saskatchewan's energy consumption in transportation exceeds the national average

The prairie

provinces are the largest residential energy consumers in Canada. They are also home to some of Canada's coldest major cities

Residential

CONSUMPTION BY PROVINCE

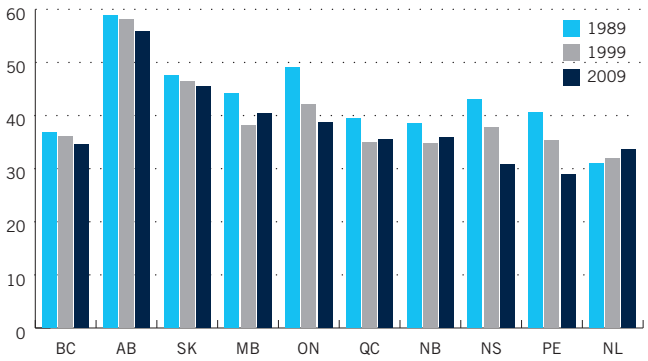
Although several factors influence residential energy use in Canada, population is the chief determinant. As such, Canada's largest provinces are also the largest overall residential energy consumers. For the same reason, the residential sector has the lowest degree of interprovincial variation in per capita energy consumption of any category of energy user. Even so, there is a considerable range in residential energy use across the provinces; per capita energy consumption in Alberta, the largest per person consumer, was 143% of the national average in 2009.

BRITISH COLUMBIANS USE

11.7%

LESS ENERGY IN THEIR HOMES THAN THE AVERAGE CANADIAN

Residential Energy Consumption (GJ per capita)



Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Residential Energy Consumption (Final Demand) by Province 2009

	Total consumption			Per capita consumption		
	terajoules	% of total	% growth: 1999-2009	GJ/capita	% of national average	% growth: 1999-2009
British Columbia	153,705	11.7	6.3	34.5	88.3	-4.4
Alberta	204,886	15.6	19.6	55.8	143.0	-3.8
Saskatchewan	46,817	3.6	-0.7	45.5	116.5	-2.1
Manitoba	49,234	3.7	12.9	40.4	103.4	5.7
Ontario	504,741	38.3	4.5	38.6	99.0	-8.0
Quebec	277,186	21.1	8.1	35.4	90.7	1.1
New Brunswick	26,841	2.0	2.9	35.8	91.8	3.0
Nova Scotia	28,996	2.2	-17.6	30.9	79.1	-18.1
Prince Edward Island	4,083	0.3	-15.0	28.9	74.1	-17.9
Newfoundland & Labrador	17,052	1.3	0.3	33.6	86.0	5.2
Canada	1,316,207	100	6.8	39.0	100	-3.7

Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Residential

CONSUMPTION BY TYPE OF ENERGY

Electricity and natural gas are by far the two most important sources of energy for residential users across Canada. While all homes use electricity for lighting and appliances, the use of natural gas, electric power or other fuels to run furnaces, hot water tanks, stoves and fireplaces depends on a number of factors, including price and availability in each province.

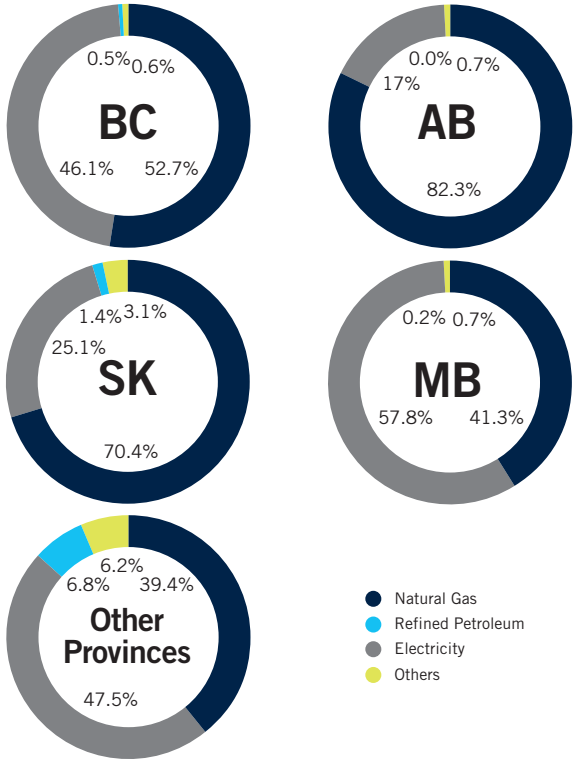
Readily available, natural gas is a staple for residential uses in Alberta and Saskatchewan such as furnaces and hot water heaters. Residential gas use in those jurisdictions far exceeds that of any other province, although Ontario is also a significant gas consumer. Natural gas accounted for 82.3% of residential energy consumption in Alberta in 2009 and 70.4% of residential consumption in Saskatchewan.

By contrast, Manitobans are the second heaviest per capita users of residential electricity in the country after Quebec (reflecting electricity used for home heating and hot water tanks due to the relatively low cost of electrical power in those provinces). Residential energy use in Atlantic Canada differs from the rest of the country as home heating oil is a common residential fuel and natural gas is unavailable in some provinces.

57.8%

ELECTRICITY'S SHARE OF MB'S RESIDENTIAL ENERGY USE — THE HIGHEST IN THE WEST

Distribution of Residential Energy Consumption by Fuel Type 2009



Note: "Other" includes natural gas liquids, coal, coke, coke oven gas and steam.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand.*

Residential Energy Consumption (Final Demand) by Type of Energy 2009 (terajoules)

	BC	AB	SK	MB	RoC	Canada
Natural gas	81,022	168,608	32,942	20,356	357,457	660,385
Electricity	70,916	34,784	11,767	28,467	431,008	576,942
Refined petroleum		91	663	81	61,974	63,634
Natural gas liquids	942	1,164	375	329	11,126	13,936
Coal	–	239	1,071	–	45,299	46,609
TOTAL	**152,880**	**204,886**	**46,818**	**49,233**	**906,864**	**1,361,506**

Note: Totals may not add up due to rounding.
Source: Statistics Canada *Report on Energy Supply and Demand.*

Residential

ENERGY PRICES

While population is a major determinant of residential energy consumption across Canada, the price of the energy available to residential consumers plays an important role in determining not only the amount, but also the type of energy consumed.

Alberta and Saskatchewan are the two largest consumers of residential energy and the largest consumers of natural gas in homes. Those two provinces also boast the lowest residential natural gas prices in Canada, and pay less for gas than their counterparts in BC and Manitoba.

By contrast, BC and Manitoba, which consume more electricity per capita than Alberta and Saskatchewan, enjoy among the lowest rates in the country for electricity. Only in Quebec are residential electricity prices lower than in Manitoba and BC.

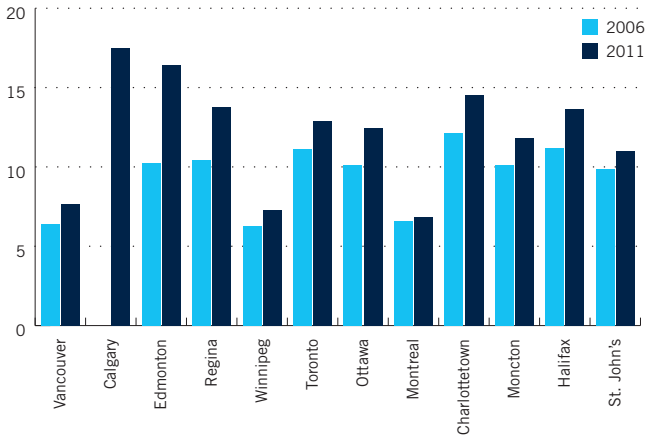
It is worth noting that the long-term decline in residential energy consumption per capita across Canada coincides with a period of rising energy prices. Average residential natural gas prices in the 2000s across Canada were more than double average prices in the 1990s.

NATURAL GAS PRICES IN ALBERTA ARE THE LOWEST IN CANADA, BELOW THE NATIONAL AVERAGE BY

28%

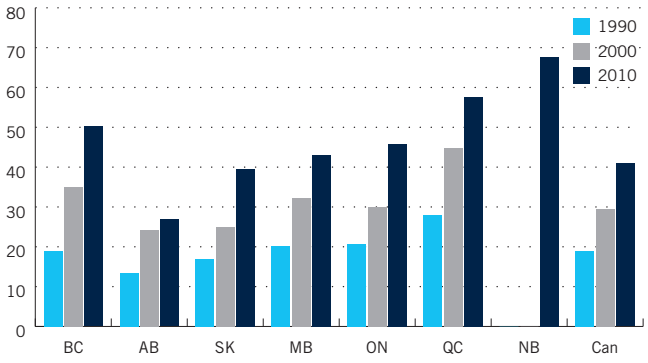
Average Electricity Price for Residential Consumers
(cents per kWh)

For monthly consumption of 1,000 kWh



Notes: 1) Data not available for Calgary prior to 2009. 2) Taxes are not included.
Source: HydroQuebec *2010 Comparison of Electricity Prices in Major North American Cities.*

Residential Natural Gas Prices by Province
(cents per cubic metre)



Note: Residential natural gas was not available in New Brunswick prior to 2007 and not at any time elsewhere in Atlantic Canada.
Source: Statistics Canada Table 129-0003.

Residential

OTHER FACTORS AFFECTING ENERGY USE

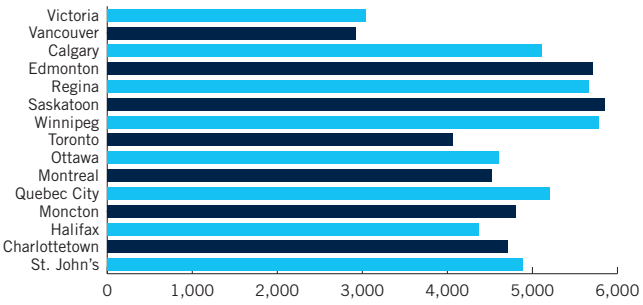
According to Natural Resources Canada, space heating accounts for 62.8% of residential energy use across Canada. As such, anything that affects home heating requirements also has an effect on per capita residential energy consumption.

Three significant drivers of home heating costs are: average home size; prevalence of single detached homes as compared to apartments, duplexes or condominiums/townhouses; and climate. In British Columbia, the average home size is the largest of any province in Canada, but this factor is more than offset by the fact that the most heavily-populated parts of BC have among the lowest heating requirements of anywhere in Canada.

By contrast, the cold weather on the Prairies adds to residential energy needs in that part of the country. The five major cities in Alberta, Saskatchewan and Manitoba have some of the highest heating requirements (as measured by average heating degree days) of major urban centres in Canada.

In addition, a higher proportion of prairie residents live in single detached homes where heating requirements are greater. In Saskatchewan and Manitoba, these factors are partially offset by the fact that the average home size is slightly below the national average.

Average Annual Heating Degree Days by Major City

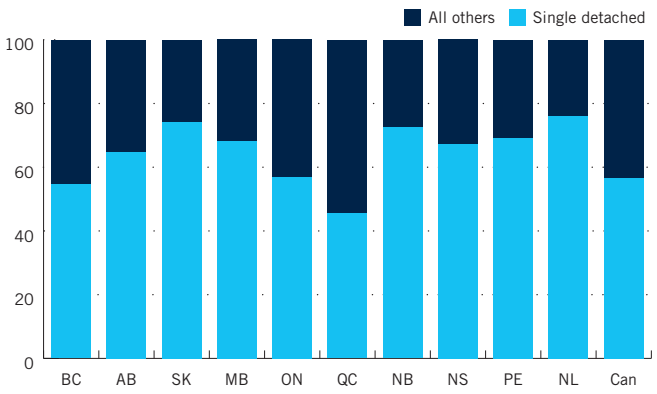


Energy Intensity by Building Type

	GJ per household		GJ per m^2		Average floor space (m^2)	
	1990	2009	1990	2009	1990	2009
Single detached	160.4	131.5	1.13	0.83	142.6	159.4
Single attached	118.8	95.9	1.0	0.72	119.4	133.7
Apartments	77.9	61.9	0.88	0.71	88.9	87.3
Mobile homes	149.3	122.9	1.58	1.18	96.2	105.1

Note: Data refer to the Canadian average.
Source: Natural Resources Canada *Comprehensive Energy Use Database, 2009.*

Prevalence of Single Detached Homes by Province 2009 (% of total)



Source: Natural Resources Canada *Comprehensive Energy Use Database, 2009.*

Note: A heating degree day measures the amount by which the average temperature on a given day is below 18 degrees Celcius. For example, if the average temperature one day was 12 degrees Celcius, the number of heating degree days for that day would be six. If the average temperature is above 18 degrees, the number of heating degree days for that day is zero.
Source: Environment Canada National Climate Data and Information Archive.

Industrial

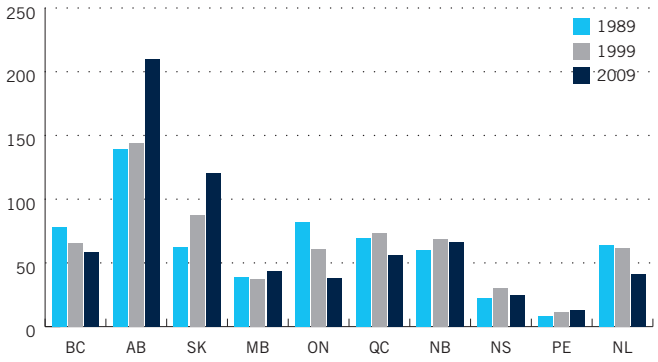
CONSUMPTION BY PROVINCE

Industrial energy usage varies dramatically across Canada. Because of the large amount of energy used in oil and gas extraction, Alberta is by far the largest overall industrial energy consumer of any province, including Ontario and Quebec. With 11% of the country's total population, Alberta accounts for 34% of industrial energy use. Oil and gas production accounts for nearly two thirds of Alberta's overall industrial energy consumption.

For similar reasons, Saskatchewan is also a major industrial energy consumer. On a per capita basis, Saskatchewan uses more energy for industrial purposes than any other province except Alberta. Oil and gas extraction makes up 73% of industrial energy use in that province.

In most provinces across Canada, including BC and Manitoba, per capita industrial energy use has been flat or declining over the past 20 years, reflecting a combination of factors including increased energy efficiency and a relative decline in national manufacturing output over that period. In Alberta and Saskatchewan, however, per capita industrial energy use is soaring because of the continued expansion and development of the oil and gas industries in those provinces.

Industrial Energy Consumption (GJ per capita)



Source: Canada West Foundation calculations using data from Statistics *Canada Report on Energy Supply and Demand* and Table 51-0001.

81%

GROWTH IN ALBERTA'S INDUSTRIAL ENERGY USE FROM 1999-2009

Industrial Energy Consumption (Final Demand) by Province 2009

	Total consumption			Per capita consumption		
	terajoules	% of total	% growth: 1999-2009	GJ/capita	% of national average	% growth: 1999-2009
British Columbia	259,550	11.6	-1.2	58.2	87.4	-11.1
Alberta	769,533	34.3	81.0	209.6	314.9	45.6
Saskatchewan	124,264	5.5	40.1	120.7	181.4	38.1
Manitoba	53,245	2.4	25.6	43.7	65.6	17.6
Ontario	499,096	22.2	-28.6	38.2	57.4	-37.2
Quebec	436,711	19.5	-18.8	55.8	83.8	-24.1
New Brunswick	49,683	2.2	-4.0	66.3	99.6	-3.8
Nova Scotia	23,539	1.0	-17.4	25.1	37.7	-17.9
Prince Edward Island	1,830	0.1	15.1	13.0	19.5	11.2
Newfoundland & Labrador	20,733	0.9	-36.5	40.8	61.3	-33.4
Canada	2,244,700	100	3.1	66.6	100	-7.1

Source: Canada West Foundation calculations using data from Statistics *Canada Report on Energy Supply and Demand* and Table 51-0001.

Industrial

CONSUMPTION BY TYPE OF ENERGY

In much the same way that industrial activity varies greatly across Canada, so too does the type of energy used in that activity. While all provinces consume primarily natural gas and electricity for industrial activity, there are considerable differences in the degree to which each is used.

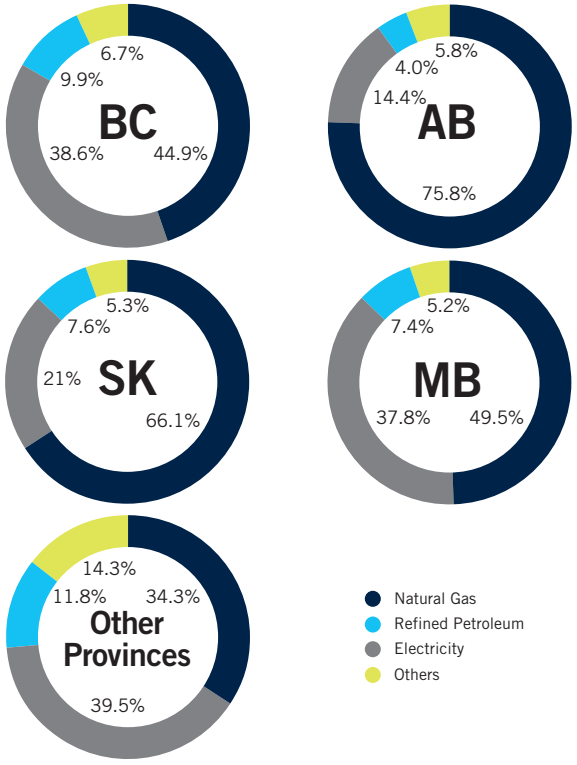
All four western provinces are relatively heavy users of natural gas in industrial activity. Natural gas use is especially intense in Alberta and Saskatchewan, where the fuel is readily available. About 76% of Alberta's industrial energy consumption is of natural gas, with electricity accounting for most of the rest. Similarly, two-thirds of Saskatchewan's industrial energy use is in the form of natural gas. Petroleum extraction and processing, two sectors where natural gas is a key input, are located primarily in Alberta and Saskatchewan, explaining much of the industrial variation between those provinces and the rest of the country.

Because of their greater hydroelectricity generating capacity, Manitoba and BC are relatively heavier users of electrical energy in industry, but still use a higher proportion of natural gas compared to provinces outside the West.

67%

OF INDUSTRIAL ENERGY USE IN WESTERN CANADA IS IN THE FORM OF NATURAL GAS

Distribution of Industrial Energy Consumption by Fuel Type 2009



Note: "Other" includes natural gas liquids, coal, coke, coke oven gas and steam.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand.*

Industrial Energy Consumption (Final Demand) by Type of Energy 2009 (terajoules)

	BC	AB	SK	MB	RoC	Canada
Natural gas	116,520	583,233	82,129	26,371	356,241	1,164,494
Electricity	100,109	111,065	26,130	20,122	410,451	667,877
Refined petroleum	25,587	30,605	9,446	3,959	122,722	192,319
Natural gas liquids	4,374	27,353	5,477	2,075	16,284	55,563
Coal	11,178	8,236	1,056	717	25,422	46,609
Others	1,784	9,043	26	–	106,985	117,838
TOTAL	**259,552**	**769,535**	**124,264**	**53,244**	**1,038,105**	**2,244,700**

Note: 1) "Others" includes coke, coke oven gas and steam. 2) Totals may not add up due to rounding.
Source: Statistics Canada *Report on Energy Supply and Demand.*

Industrial

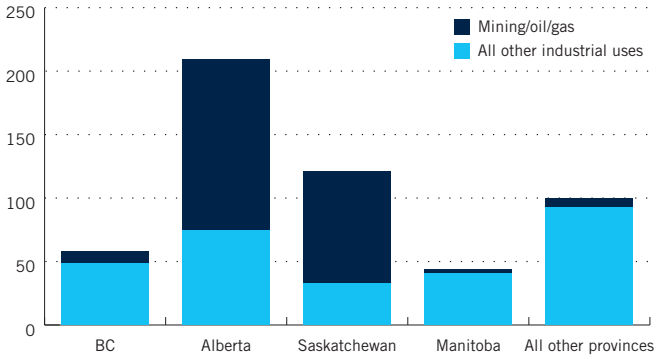
CONSUMPTION BY END USE

For most provinces, manufacturing activity is the largest component of industrial energy use, accounting for between 80% and 90% of overall provincial industrial consumption. BC sits at the low end of this range because of the energy consumption in its mining and natural gas extraction activity while manufacturing makes up 87% of industrial energy use in Manitoba.

Alberta and Saskatchewan are the two major exceptions to this general trend. Mining and oil and gas extraction make up close to two thirds of all industrial energy use in Alberta and close to 73% of energy use in Saskatchewan. Since 1979, the level of energy use in mining, and oil and gas extraction has gone up 1,044% (34% per year) in Alberta and 181% (5.8% per year) in Saskatchewan.

Oil and gas extraction completely accounts for the fact that Alberta and Saskatchewan are such high industrial energy users. In fact, when mining, oil and gas are removed from consideration, all four western provinces consume less industrial energy on a per capita basis than the rest of Canada.

Industrial Energy Consumption by End-Use 2009
(GJ per capita)



Note: The "All other industrial uses" category includes manufacturing, forestry and construction.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

52.5%

OF INDUSTRIAL ENERGY CONSUMPTION IN THE WEST IS IN MINING, OIL AND GAS

Industrial Energy Consumption (Final Demand) by End-Use 2009

	BC		AB		SK		MB		RoC		Canada	
	terajoules	GJ/capita	terajoules	GJ/capita	terajoules	GJ/capita	terajoules	GJ/capita	terajoules	GJ/capita	terajoules	GJ/capita
Mining/oil/gas	42,904	9.6	497,128	135.4	90,256	87.7	3,538	2.9	73,592	3.2	707,418	21.0
Manufacturing	207,826	46.6	265,360	72.3	28,733	27.9	46,506	38.1	926,711	39.7	1,475,136	43.7
Forestry & logging	3,499	0.8	755	0.2	65	0.1	n/a	n/a	8,431	0.4	12,750	0.4
Construction	5,325	1.2	6,293	1.7	5,212	5.1	3,197	2.6	29,366	1.3	49,393	1.5
TOTAL	**259,550**	**58.2**	**769,536**	**209.6**	**124,264**	**120.7**	**53,245**	**43.7**	**1,038,105**	**44.5**	**2,244,700**	**66.6**

Note: Totals may not add up due to rounding.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Transportation

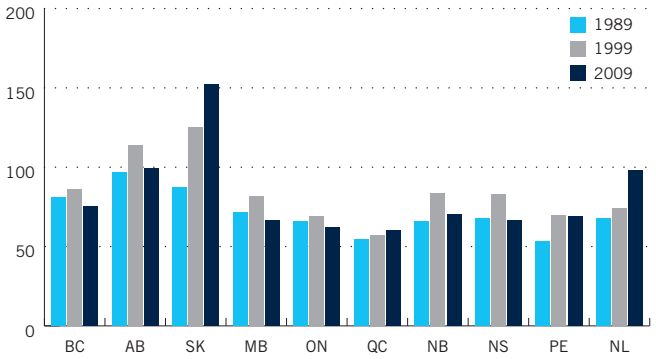
CONSUMPTION BY PROVINCE

Energy consumption in the transportation sector is broadly dependent upon a number of factors: population size, relative population dispersion or density, and whether a province is a significant hub for shipping or air travel. In general, the western provinces are relatively large users of energy in transportation. The region as a whole accounts for 31% of Canada's total population but 39% of transportation energy use.

Alberta and BC are, by far, the region's most significant energy consumers in transportation. Alberta nudges ahead of BC due to a few factors. Both provinces contain several busy airports, but Alberta's status as a key component of the CANAMEX shipping corridor contributes to its transportation energy usage, as does the frequency of travel between Calgary, Edmonton and Fort McMurray. British Columbia's significance as a Pacific port bolsters its energy consumption figures.

For most provinces, per capita energy consumption in transportation has been falling over the past decade. The only exceptions have been Saskatchewan – where rising energy use in pipeline transportation has caused overall consumption to soar – as well as Quebec and Newfoundland and Labrador. Manitoba has seen one of the largest drops in per capita energy use in transportation of any province.

Energy Consumption in Transportation (GJ per capita)



Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

113.9%

AMOUNT BY WHICH TRANSPORTATION ENERGY CONSUMPTION IN SK EXCEEDS THE NATURAL AVERAGE

Energy Consumption (Final Demand) in Transportation by Province 2009

	Total consumption			Per capita consumption		
	terajoules	% of total	% growth: 1999-2009	GJ/capita	% of national average	% growth: 1999-2009
British Columbia	334,850	14.0	-2.8	75.1	105.6	-12.6
Alberta	364,481	15.2	8.6	99.3	139.7	-12.6
Saskatchewan	156,437	6.5	23.2	152.0	213.9	21.4
Manitoba	81,130	3.4	-12.9	66.5	93.6	-18.4
Ontario	810,070	33.8	1.8	62.0	87.2	-10.4
Quebec	469,952	19.6	13.0	60.0	84.5	5.7
New Brunswick	52,560	2.2	-16.3	70.1	98.7	-16.1
Nova Scotia	62,382	2.6	-19.2	66.4	93.5	-19.7
Prince Edward Island	9,773	0.4	3.1	69.3	97.5	-0.4
Newfoundland & Labrador	49,776	2.1	25.6	98.0	137.8	31.8
Canada	2,396,343	100	3.9	71.1	100	-6.4

Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Transportation

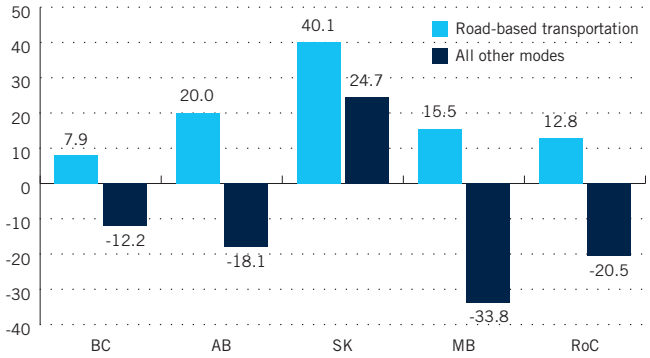
CONSUMPTION BY MODE OF TRANSPORTATION

Road travel is the primary consumer of transportation energy in western Canada. Retail pump sales (a measure of energy use in personal vehicles) dominate consumption in the region, accounting for 52.9% of total energy use. The next-highest consumer is road transportation/urban transit (15.4%), which measures road travel by urban transit, trucking businesses and other commercial users.

There are important differences in transportation energy consumption patterns across the West. Driving is popular across the three prairie provinces; Saskatchewan, Alberta and Manitoba are the largest per capita users of energy in personal vehicles across Canada. BC and Alberta are relatively large energy users in air transportation, while BC is a relatively large consumer of energy in marine activities. For its part, Saskatchewan dwarfs all other provinces in energy consumption in pipeline transportation.

In general, energy consumption patterns in transportation are shifting toward road travel and away from other forms of transportation. Across western Canada, and Canada as a whole, energy consumption in road travel has risen considerably since 2002, while consumption by all other modes of transportation has fallen. The sole exception to this general trend is Saskatchewan because of the surge in energy use in pipeline transportation.

Growth in Energy Consumption by Mode of Transportation 2002-2009 (%)



Notes: 1) Road-based transportation includes retail pump sales and road transport/urban transit. 2) "All other modes" of transportation include pipeline, railway, marine and air transport.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand.*

One Third

PIPELINES' SHARE OF TRANSPORTATION ENERGY USE IN SASKATCHEWAN

Energy Consumption (Final Demand) in Transportation by Mode of Transportation 2009

	BC		AB		SK		MB		RoC		Canada	
	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita
Retail pump sales	166,729	37.4	211,783	57.7	67,577	65.7	49,906	40.9	869,414	37.2	1,365,409	40.5
Road transport/ urban transit	47,190	10.6	52,726	14.4	27,884	27.1	16,224	13.3	180,000	7.7	324,024	9.6
Pipelines	17,057	3.8	31,543	8.6	52,034	50.6	5,350	4.4	30,299	1.3	136,283	4.0
Airlines	55,443	12.4	28,053	7.6	2,836	2.8	6,723	5.5	110,601	4.7	203,656	6.0
Marine	41,561	9.3	–	–	–	–	–	–	46,447	2.0	88,008	2.6
Railways	6,871	1.5	40,376	11.0	6,097	5.9	2,926	2.4	31,663	1.4	87,933	2.6
TOTAL	**334,850**	**75.1**	**364,481**	**99.3**	**156,437**	**152.0**	**81,130**	**66.5**	**1,459,445**	**62.5**	**2,396,343**	**71.1**

Note: 1) Road transport/urban transit refers to all energy consumed by those primary engaged in truck transport services, in the operation of urban, inter-urban and rural transit systems, school buses, charter and sightseeing buses, and taxi and limousine services to airports and stations. 2) Figures may not add up due to rounding and other adjustments.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Transportation

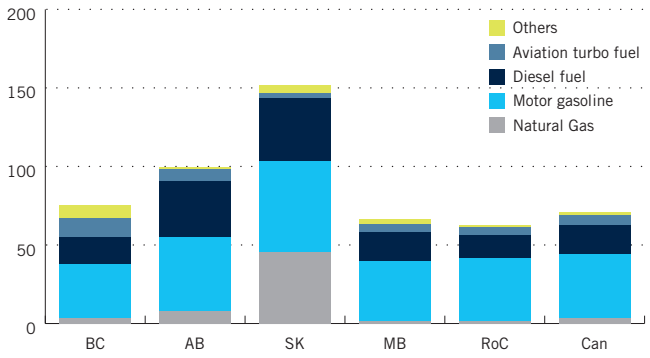
CONSUMPTION BY FUEL TYPE

Refined petroleum products overwhelmingly dominate transportation energy use. The various types of fuels made from refined petroleum account for 93.6% of the energy used in transportation across Canada, although there is some variation in energy use across the country by type of petroleum.

In every western province, as well as nationally, motor gasoline is the most commonly used transportation fuel. On a per capita basis, gasoline use is particularly high in Alberta and Saskatchewan, but largely because of the prevalence of diesel fuel across the West, gasoline accounts for a relatively low share of transportation energy use in western Canada. Diesel has been the fastest growing fuel source in Alberta, Saskatchewan and Manitoba since 2002.

In terms of other petroleum products, BC sits as the most significant consumer of aviation turbo, but the largest growth fuel in the province has been heavy fuel oil – used in the shipping industry – which has increased by 19% since 2002. Saskatchewan is the only province in Canada that is a major user of natural gas as a transportation fuel; the gas is used primarily in natural gas pipeline transportation. The compression required to send natural gas (primarily produced in Alberta) across the continent is concentrated at the head of the pipelines which are largely in Saskatchewan.

Energy Consumption in Transportation by Fuel Type 2009 (GJ per capita)



Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

99.9%

OF NATURAL GAS USE IN TRANSPORTATION IN SK IS IN PIPELINE OPERATION

Transportation Energy Consumption (Final Demand) by Type of Energy 2009

	BC		AB		SK		MB		RoC		Canada	
	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita
Natural Gas	16,998	3.8	30,048	8.2	46,623	45.3	2,060	1.7	30,890	1.3	126,619	3.8
Electricity	828	0.2	1,895	0.5	5,450	5.3	3,329	2.7	1,645	0.1	13,147	0.4
Refined petroleum	313,856	70.4	330,819	90.1	104,196	101.2	75,490	61.9	1,420,971	60.9	2,245,332	66.6
of which:												
Motor gasoline	152,800	34.3	170,930	46.6	59,483	57.8	45,990	37.7	938,349	40.2	1,367,552	40.6
Diesel fuel	73,854	16.6	131,836	35.9	41,877	40.7	22,777	18.7	345,777	14.8	616,121	18.3
Aviation turbo fuel	55,288	12.4	27,919	7.6	2,783	2.7	6,650	5.5	109,930	4.7	202,570	6.0
Heavy fuel oil	31,760	7.1	–	0.0	–	0.0	–	0.0	26,244	1.1	58,004	1.7
Natural gas liquids	3,169	0.7	1,719	0.5	167	0.2	251	0.2	5,939	0.3	11,245	0.3
TOTAL	**334,851**	**75.1**	**364,481**	**99.3**	**156,436**	**152.0**	**81,130**	**66.5**	**1,459,445**	**62.5**	**2,396,343**	**71.1**

Notes: Refined petroleum data do not include small amounts of aviation gasoline. Figures may not add up due to rounding.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Transportation

FUEL PRICES BY PROVINCE

Fuel prices at the pump vary throughout the country for two major reasons: differences in fuel consumption taxes (especially at the provincial level); and differences in refining and marketing costs and producer margins. Within this general framework, a simple pattern emerges: gasoline and diesel cost significantly less in the prairie provinces than in most other places in Canada.

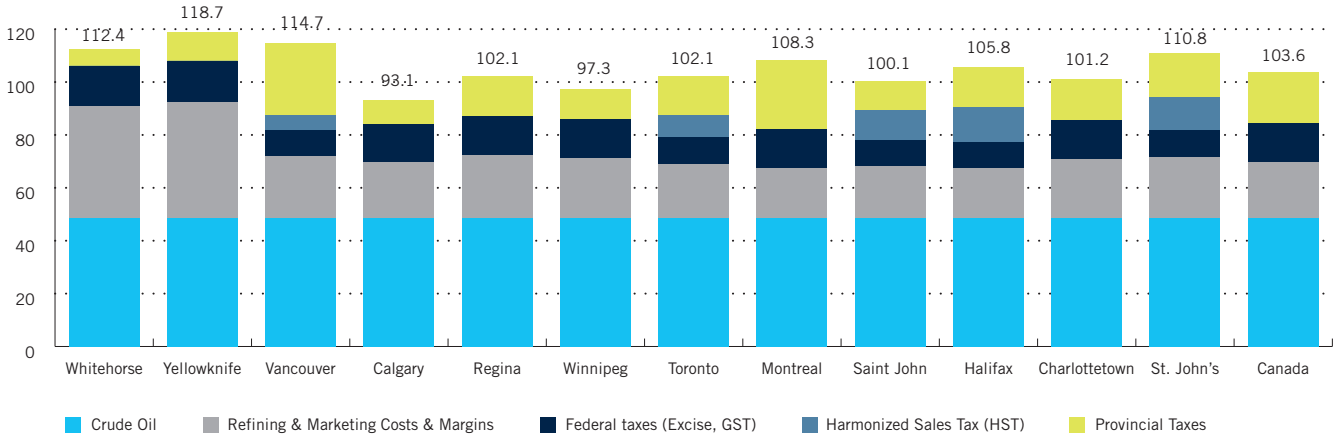
Most of Canada's refinery capacity is located near Edmonton, in Saint John or near Montreal. As a result, refining and marketing costs, as well as producer margins tend to be lower in those areas. In Alberta, this advantage is compounded by relatively low provincial taxes (including no sales tax), which helps to keep gasoline prices lower than anywhere else in Canada. Similarly, relatively low provincial taxes keep gasoline in Saskatchewan and Manitoba relatively cheap as well.

By contrast, high provincial taxes (including the joint federal-provincial harmonized sales tax) offset the refining advantage in Montreal and Saint John. In general, provincial taxes, and therefore gasoline prices, are higher in eastern Canada than in the West. BC is a notable exception, however, as a province-wide carbon tax helps make gasoline in that province among the most expensive in the country.

42.9 CENTS/L

AVERAGE TAXES ON GASOLINE IN BC IN 2010 — THE HIGHEST IN CANADA

Regular Gasoline Pump Price Components 2010



Source: Natural Resources Canada.

Transportation

VEHICLE USE

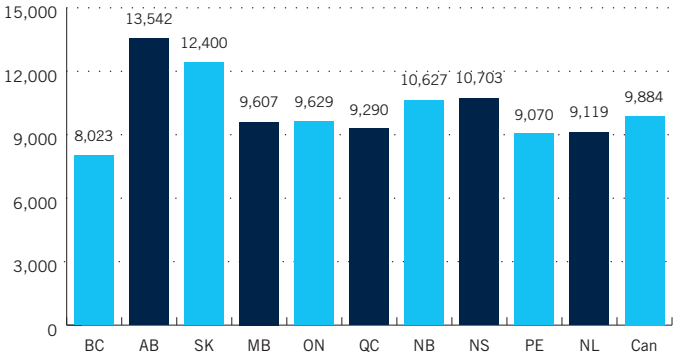
Several factors explain why westerners consume more energy in road transportation compared to other Canadians. The first is that Albertans and Saskatchewanians own more vehicles and drive them further than other Canadians.

The average Canadian owns 0.61 vehicles and drives 9,844 km per person per year. Each Albertan, however, owns 0.77 vehicles and drives 13,542 km per person per year. This difference is in part a reflection of the proximity and close economic cooperation between Alberta's two largest population centres. Residents of Saskatchewan own the same number of vehicles per person as Albertans and drive them only slightly less.

Manitobans drive about as much as other Canadians and own about the same number of vehicles as the national average. For their part, British Columbia residents drive significantly less than the average Canadian.

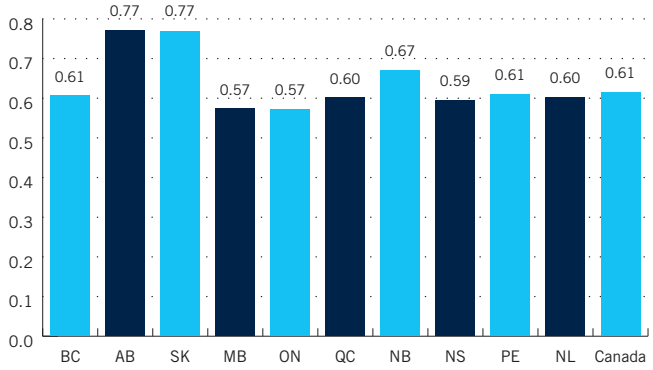
Other contributing factors behind energy consumption by road vehicles include the size of the vehicles people drive and the age of the fleet. Drivers in Alberta and Saskatchewan tend to prefer trucks and sport-utility vehicles, which are less fuel efficient compared to smaller cars. In addition newer cars are generally more fuel efficient than older ones. However, older cars are much more common in the West than elsewhere in Canada; the proportion of vehicles on the road that are more than 10 years old is higher in all four western provinces than in Canada as a whole.

Motor Vehicle Travel by Province 2009
(vehicle km per person)



Note: Measured by province of vehicle registration.
Source: Statistics Canada *Canadian Vehicle Survey, 2009.*

Number of Registered Motor Vehicles per Person by Province 2009



Source: Statistics Canada *Canadian Vehicle Survey, 2009.*

Agriculture

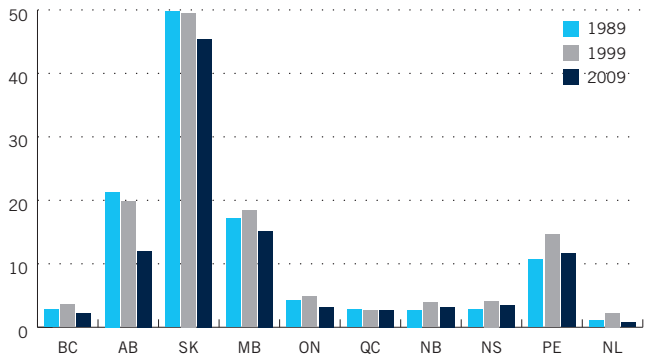
CONSUMPTION BY PROVINCE

Unlike many other sectors, total energy consumption in agriculture is not dependent on the level of population in a given province. Rather, it is based on the availability of land for agricultural purposes and the intensity of agricultural activity across Canada. As such, there is significant variation between the provinces where agricultural activity takes place and those where it does not.

On the whole, agriculture is not a major energy consumer, accounting for about 3% of final end-use energy consumption across Canada. Not surprisingly, agricultural energy use is concentrated in the West – in particular, Saskatchewan and Alberta. These two provinces account for just under half of Canada's total agricultural energy consumption, with Saskatchewan consuming slightly more than Alberta. On a per capita basis, Saskatchewan is by far the largest agricultural energy consumer. This reflects the fact that almost half of Canada's arable land is in Saskatchewan.

Energy use in agriculture is declining across Canada. On a per capita basis, energy use has fallen by more than 25% in Canada over the past decade. BC and Alberta have seen some of the largest decreases in the country.

Energy Consumption in Agriculture (GJ per capita)



Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

8 TIMES

THE NATIONAL AVERAGE: AGRICULTURE-RELATED ENERGY CONSUMPTION IN SK

Energy Consumption (Final Demand) in Agriculture by Province 2009

	Total consumption			Per capita consumption		
	terajoules	% of total	% growth: 1999-2009	GJ/capita	% of national average	% growth: 1999-2009
British Columbia	9,536	5.0	-33.7	2.1	37.9	-40.3
Alberta	44,218	23.3	-24.4	12.0	213.8	-39.2
Saskatchewan	46,759	24.6	-6.9	45.4	806.3	-8.3
Manitoba	18,495	9.7	-12.0	15.2	269.1	-17.6
Ontario	41,943	22.1	-24.8	3.2	57.0	-33.8
Quebec	21,081	11.1	7.7	2.7	47.8	0.7
New Brunswick	2,411	1.3	-17.4	3.2	57.1	-17.3
Nova Scotia	3,314	1.7	-13.9	3.5	62.6	-14.3
Prince Edward Island	1,644	0.9	-17.3	11.7	206.8	-20.2
Newfoundland & Labrador	368	0.2	-68.9	0.7	12.9	-67.4
Canada	190,024	100	-17.3	5.6	100	-25.5

Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Agriculture

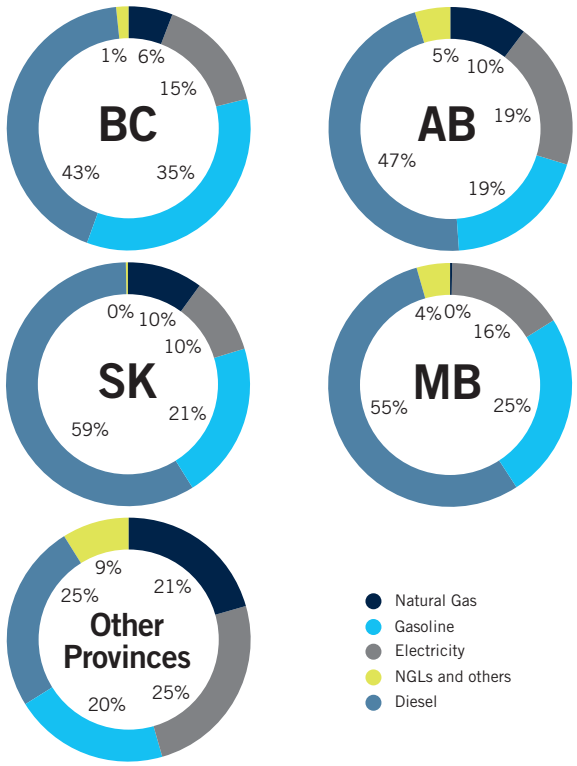
CONSUMPTION BY TYPE OF ENERGY

Refined petroleum products account for the vast majority of energy consumption in the agricultural sector. This relatively heavy weighting is especially pronounced in western Canada where refined petroleum products make up between 68.4% (Alberta) and 79.5% (Manitoba) of final energy demand in agriculture.

Unlike the transportation sector, where refined petroleum products also dominate the energy mix, motor gasoline is not the dominant fuel used in agricultural operations. While gasoline has some usage for operating farm machinery, diesel fuel is a far more important energy source, especially in western Canada. In Saskatchewan and Manitoba in particular, diesel fuel accounted for more than half of all agricultural energy consumption in 2009. Moreover, the use of diesel in agricultural applications in those provinces has soared in recent years, rising by nearly one third in both provinces since 2004.

Diesel was also the most important agricultural energy source in BC and Alberta, although its use has fallen in recent years in those provinces. Diesel accounted for just 23.9% of energy final demand in agriculture outside of the western provinces.

Distribution of Agriculture Energy Consumption by Fuel Type 2009



Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand*.

Agriculture Energy Consumption (Final Demand) by Type of Energy 2009

	BC		AB		SK		MB		RoC		Canada	
	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita
Natural gas	557	0.12	4,612	1.26	4,727	4.59	69	0.06	13,954	0.60	23,919	0.71
Electricity	1,462	0.33	8,587	2.34	4,817	4.68	2,930	2.40	17,079	0.73	34,875	1.03
Refined petroleum	7,368	1.65	29,051	7.91	37,139	36.09	14,709	12.06	34,126	1.46	122,393	3.63
of which:												
Motor gasoline	3,304	0.74	8,484	2.31	9,709	9.43	4,575	3.75	13,832	0.59	39,904	1.18
Diesel fuel	4,064	0.91	20,552	5.60	27,373	26.60	10,123	8.30	17,000	0.73	79,112	2.35
Natural gas liquids	149	0.03	225	0.06	76	0.07	787	0.65	5,857	0.25	7,094	0.21
Others	–	–	1,743	0.47	–	–	–	–	–	–	1,743	0.05
TOTAL	9,536	2.14	44,218	12.05	46,759	45.44	18,495	15.17	71,016	3.04	190,024	5.64

Note: 1) Totals may not add up due to rounding. 2) Does not include activities associated with food processing and farm machinery manufacture and repair.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Commercial/Public Administration

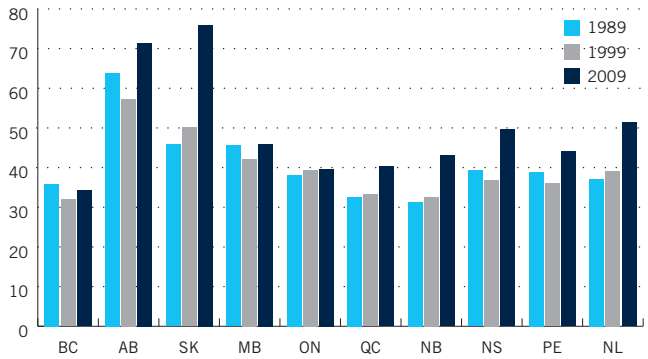
CONSUMPTION BY PROVINCE

There is a considerable range in energy consumption in commercial and public administration activity across western Canada. As with all other energy end-use categories, residents of Alberta and Saskatchewan consume significantly more energy compared to residents of other provinces. Per capita consumption in Manitoba is in line with the national average and consumption in BC is the lowest of any province.

It is unclear what accounts for the significant differences in energy consumption; detailed information is not available on the type of commercial activity that takes place in each province. However, two possible contributing factors are climate (the number of heating degree days is higher on the Prairies than elsewhere in Canada) and the energy efficiency of existing buildings.

Unlike most other sectors, per capita energy use in commercial/public administration applications is rising across Canada, including in all four western provinces.

Energy Consumption in Commercial/Public Administration (GJ per capita)



Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Energy Consumption (Final Demand) in Commercial/Public Administration by Province 2009

	Total consumption			Per capita consumption		
	terajoules	% of total	% growth: 1999-2009	GJ/capita	% of national average	% growth: 1999-2009
British Columbia	152,731	10.2	19.0	34.2	76.8	7.0
Alberta	261,993	17.4	54.7	71.4	160.2	24.5
Saskatchewan	78,148	5.2	53.7	75.9	170.4	51.5
Manitoba	56,085	3.7	16.3	46.0	103.2	8.9
Ontario	518,013	34.5	14.3	39.6	89.0	0.6
Quebec	315,313	21.0	29.6	40.3	90.4	21.3
New Brunswick	32,275	2.1	31.9	43.1	96.7	32.2
Nova Scotia	46,591	3.1	35.5	49.6	111.3	34.8
Prince Edward Island	6,209	0.4	26.7	44.0	98.8	22.3
Newfoundland & Labrador	26,114	1.7	24.9	51.4	115.3	31.1
Canada	1,502,512	100	26.7	44.6	100	14.2

Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Commercial/Public Administration

CONSUMPTION BY TYPE OF ENERGY

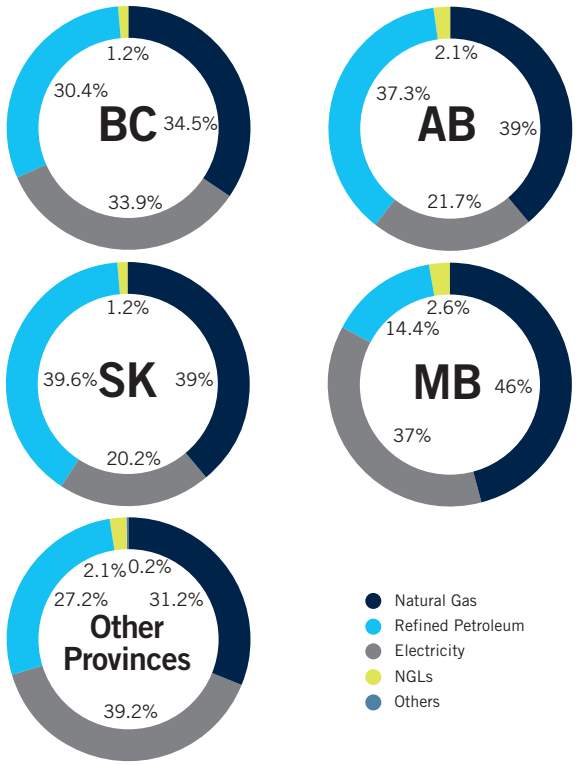
In addition to the fact that western Canada (except BC) consumes more energy in the commercial/public administration sector compared to the rest of Canada, there are also marked differences in the type of energy consumed.

In particular, those in the prairie provinces are much larger consumers of natural gas in the commercial/public administration sector compared to other Canadians. While Alberta and Saskatchewan are the largest overall users of natural gas (on a per capita basis), Manitoba is the most dependent on that energy source; natural gas accounts for 46.0% of energy final demand in the commercial/public administration sector.

Alberta and Saskatchewan are also heavy users of refined petroleum products in this sector compared to other Canadians. Per capita refined petroleum consumption in those two provinces was more than twice the national average. Relatively high use of diesel fuel in Alberta and Saskatchewan was a major contributing factor.

By contrast, electricity consumption in commercial/public administration is relatively constant across Canada. Even in Alberta and Saskatchewan, electricity consumption levels are comparable to those in other provinces.

Distribution of Commercial/Public Administration Energy Consumption by Fuel Type 2009



Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand.*

Commercial/Public Administration Energy Consumption (Final Demand) by Type of Energy 2009

	BC		AB		SK		MB		RoC		Canada	
	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita	Total (TJ)	GJ/capita
Natural gas	51,773	11.6	102,093	27.8	29,864	29.0	25,790	21.1	299,201	12.8	508,721	15.1
Electricity	50,870	11.4	56,848	15.5	15,502	15.1	20,771	17.0	375,539	16.1	519,530	15.4
Refined petroleum	45,717	10.2	97,639	26.6	30,348	29.5	8,073	6.6	260,561	11.2	442,338	13.1
Natural gas liquids	1,815	0.4	5,411	1.5	942	0.9	1,453	1.2	20,425	0.9	30,046	0.9
Others	–	0.0	5	0.0	–	0.0	–	0.0	1,875	0.1	1,880	0.1
TOTAL	**150,175**	**33.7**	**261,996**	**71.4**	**76,656**	**74.5**	**56,087**	**46.0**	**957,601**	**41.0**	**1,502,515**	**44.6**

Notes: 1) "Others" includes steam and coal. 2) Totals may not add up due to rounding.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Energy Consumption by Type of Energy

43.7%
of energy consumed in western Canada is in the form of natural gas

44.6%
of electricity in the West is consumed by the industrial sector

62 GJ
Per capita electricity consumption in Manitoba in 2009 – the highest in western Canada

70.6%
of refined petroleum consumption in western Canada is in the transportation sector

94.3%
is the amount by which refined petroleum consumption in Saskatchewan exceeds the national average

AB & SK
are the only two provinces where per capita natural gas consumption is rising

Natural Gas

CONSUMPTION BY PROVINCE

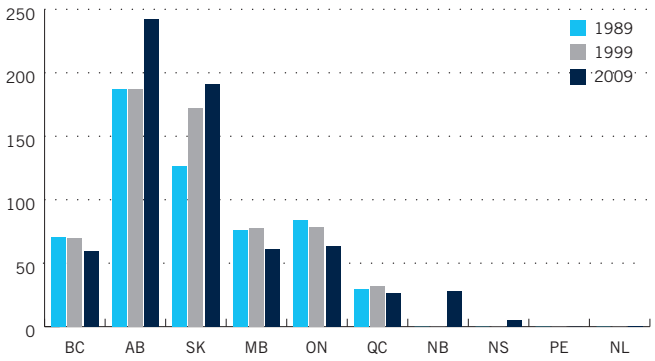
Natural gas consumption in Canada is dominated by two provinces – Alberta and Saskatchewan. At nearly 889 terajoules in 2009, Alberta is the single largest consumer of natural gas in Canada – more even than Ontario. Alberta accounted for 35.8% of Canadian natural gas consumption that year. Not surprisingly, therefore, it is also the country's largest gas consumer on a per capita basis. At 242 GJ per capita, gas consumption in Alberta is more than three times the national average. Not only that, but while final demand for natural gas is falling in several provinces, it is growing rapidly in Alberta.

For its part, Saskatchewan's total gas consumption is far lower than in Alberta, but on a per capita basis, final demand for natural gas in Saskatchewan is 2.5 times the national average. Saskatchewan is the only province other than Alberta where natural gas is a significant and growing source of energy.

BC is western Canada's second largest gas consumer and third nationally. However, on a per capita basis, gas consumption in BC is well below the national average and has fallen by 14.1% since 1999.

Manitoba consumes slightly more natural gas than BC on a per capita basis, but final demand in that province is falling faster than anywhere else in the country. From 1999 to 2009, per capita natural gas consumption in Manitoba has fell by 20.9%.

Natural Gas Consumption (GJ per capita)



Note: Data refer to final consumption only and do not include natural gas used to generate electricity or to produce refined hydrocarbons.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

15.6%

DECREASE IN NATURAL GAS CONSUMPTION IN MANITOBA FROM 1999-2009

Natural Gas Consumption (Final Demand) by Province 2009

	Total consumption			Per capita consumption		
	terajoules	% of total	% growth: 1999-2009	GJ/capita	% of national average	% growth: 1999-2009
British Columbia	266,873	10.7	-4.5	59.8	81.2	-14.1
Alberta	888,594	35.8	60.8	242.1	328.6	29.3
Saskatchewan	196,285	7.9	12.3	190.7	258.9	10.7
Manitoba	74,646	3.0	-15.6	61.2	83.1	-20.9
Ontario	823,605	33.2	-8.8	63.0	85.6	-19.7
Quebec	205,116	8.3	-11.3	26.2	35.6	-17.0
New Brunswick	20,994	0.8	n/a	28.0	38.0	n/a
Nova Scotia	4,911	0.2	n/a	5.2	7.1	n/a
Prince Edward Island	–	0.0	n/a	0.0	0.0	n/a
Newfoundland & Labrador	192	0.0	n/a	0.4	0.5	n/a
Canada	2,484,134	100	11.3	73.7	100	0.3

Note: Data refer to final consumption only and do not include natural gas used to generate electricity or to produce refined hydrocarbons.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Natural Gas

CONSUMPTION BY SECTOR

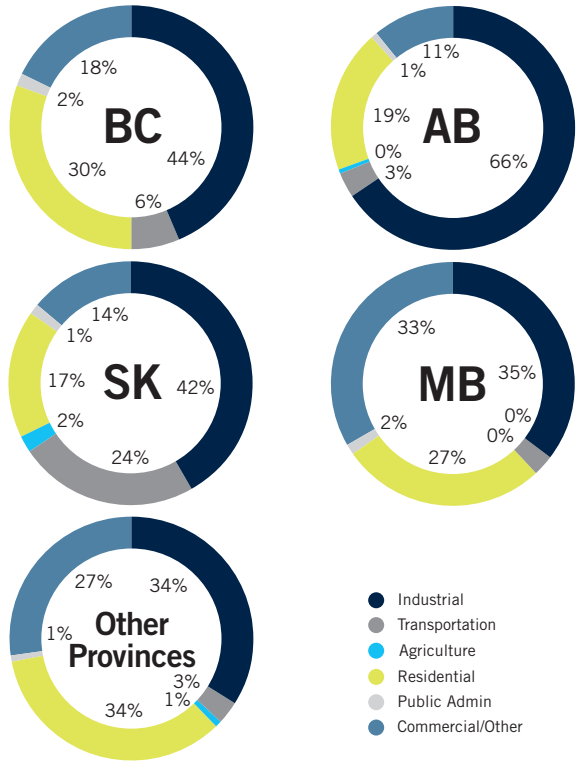
The industrial sector is the largest consumer of natural gas in western Canada, largely because of its use as a fuel in mining operations and oil and gas extraction. Industrial gas consumption is especially intense in Alberta where it is an important source of energy for oil sands operations. Nearly two thirds of final demand for natural gas in Alberta in 2009 was for industrial purposes.

While the industrial sector accounts for the largest share of gas consumption all across the West, its use outside Alberta is relatively evenly divided across industrial, residential and commercial uses. Those three sectors account for about 91.6% of all final consumption of natural gas outside of Alberta.

As in Alberta, higher-than-average natural gas consumption in Saskatchewan is in part due to its use in oil and gas extraction, but also because of its use as a fuel in pipeline transportation. The transportation sector in Saskatchewan accounted for 23.8% of natural gas use in that province in 2009, compared to an average of 5.1% nationally.

Natural gas consumption in BC was also skewed toward industrial production, especially in the extractive industries and to fuel pulp and paper production. In Manitoba, final demand for natural gas closely mirrored its pattern of use outside the West.

Distribution of Natural Gas Consumption by Sector 2009



Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand.*

Total Natural Gas Consumption (Final Demand) by Sector 2009

	BC		AB		SK		MB		RoC		Canada	
	petajoules	% of total	petajoules	% of total	petajoules	% of total	petajoules	% of total	petajoules	% of total	petajoules	% of total
Industrial	116.5	43.7	583.2	65.6	82.1	41.8	26.4	35.3	356.2	33.7	1,164.5	46.9
Transportation	17.0	6.4	30.0	3.4	46.6	23.8	2.1	2.8	30.9	2.9	126.6	5.1
Agriculture	0.6	0.2	4.6	0.5	4.7	2.4	0.1	0.1	14.0	1.3	23.9	1.0
Residential	81.0	30.4	168.6	19.0	32.9	16.8	20.4	27.3	357.5	33.8	660.4	26.6
Public Admin	4.8	1.8	6.6	0.7	2.7	1.4	1.0	1.4	9.5	0.9	24.7	1.0
Commercial/other	47.0	17.6	95.4	10.7	27.2	13.8	24.8	33.2	289.7	27.4	484.0	19.5
TOTAL	**266.9**	**100.0**	**888.6**	**100.0**	**196.3**	**100.0**	**74.6**	**100.0**	**1,057.7**	**100.0**	**2,484.1**	**100.0**

Notes: 1) Totals may not add up due to rounding. 2) Consumption of energy products does not include producer use and non-energy uses.
Source: Canada West Foundation calculations using data from Statistics Canada Report on Energy Supply and Demand.

Refined Petroleum

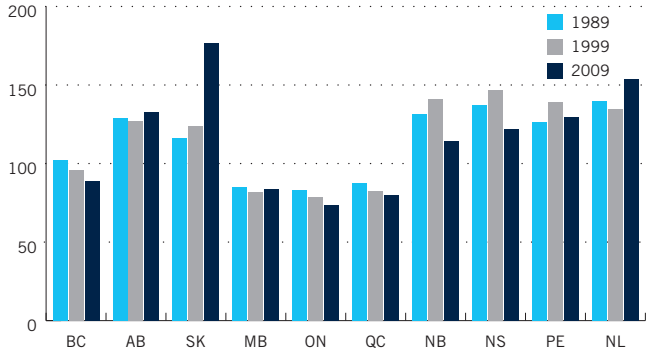
CONSUMPTION BY PROVINCE

As with natural gas, Alberta and Saskatchewan are by far the largest per capita consumers of refined petroleum across all end-uses. However, the variation between per capita consumption levels nationally and that in those two provinces is much narrower compared with natural gas.

Saskatchewan is the largest per capita final end-user of refined petroleum products, consuming 177 GJ of that fuel type per person in 2009 – nearly twice the national average rate of consumption. In Alberta, per capita consumption was somewhat lower (133 GJ per person), but still higher than the national average rate.

For Canada as a whole, per capita final demand for refined petroleum has been falling. Consumption per person in 2009 was 2.5% lower than in 1999. While consumption has also fallen in BC, the three prairie provinces have seen per capita use of refined petroleum grow over the past ten years. The increases were relatively modest in Alberta and Manitoba, but consumption of refined petroleum products in Saskatchewan has soared since the late 1990s.

Refined Petroleum Consumption (GJ per capita)



Note: Data refer to final consumption only and do not include refined petroleum used directly by producers, used for non-energy purposes or used to generate electricity.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Refined Petroleum Consumption (Final Demand) by Province 2009

	Total consumption			Per capita consumption		
	terajoules	% of total	% growth: 1999-2009	GJ/capita	% of national average	% growth: 1999-2009
British Columbia	395,906	12.9	3.1	88.8	97.6	-7.3
Alberta	488,204	15.9	30.3	133.0	146.3	4.8
Saskatchewan	181,778	5.9	44.7	176.6	194.3	42.7
Manitoba	102,310	3.3	9.7	83.9	92.3	2.7
Ontario	959,406	31.3	5.9	73.4	80.8	-6.7
Quebec	626,144	20.4	4.1	80.0	88.0	-2.6
New Brunswick	85,866	2.8	-18.9	114.6	126.0	-18.7
Nova Scotia	114,208	3.7	-16.6	121.6	133.7	-17.1
Prince Edward Island	18,317	0.6	-3.3	129.8	142.8	-6.6
Newfoundland & Labrador	78,195	2.6	9.1	153.9	169.2	14.5
Canada	3,066,018	100	8.1	90.9	100	-2.5

Note: Data refer to final consumption only and do not include refined petroleum used directly by producers, used for non-energy purposes or used to generate electricity.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Refined Petroleum

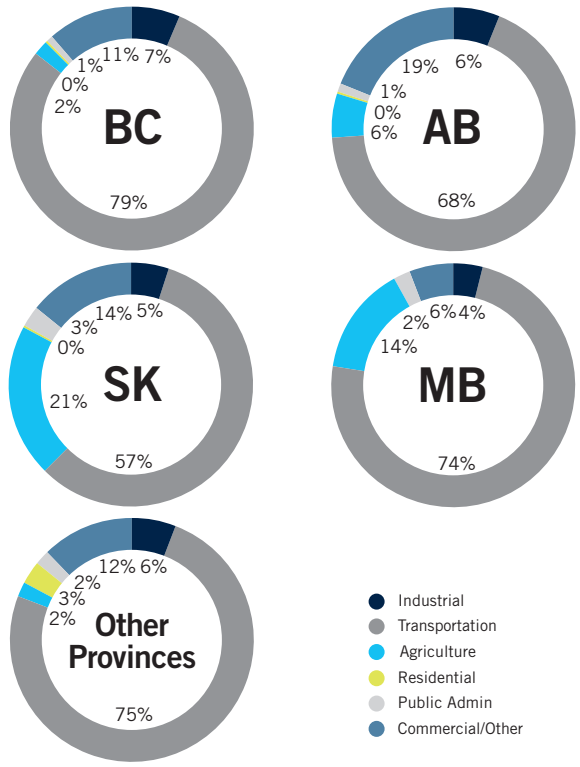
CONSUMPTION BY SECTOR

Overwhelmingly, the main use of petroleum is in the transportation sector, a fact consistent from province to province. Overall, transportation sector consumption accounts for 73% of all refined petroleum use in Canada. In the western provinces that figure is slightly lower, at 71%, largely because the agriculture sector is a relatively large consumer of oil-based fuels on the Prairies. This is especially true of Saskatchewan and Manitoba, where agriculture accounts for 20.4% and 14.4% of provincial refined petroleum consumption, respectively.

Outside of transportation, commercial and public administration accounts for most remaining refined petroleum consumption across Canada, including in the West.

One area where final demand patterns for refined petroleum differ across Canada is in residential use. While western Canadians typically use natural gas or electricity to heat their homes, home heating oil is a common fuel used in many residences in Atlantic Canada. As a result, the Atlantic provinces are relatively large consumers of refined petroleum on a per capita basis.

Distribution of Refined Petroleum Consumption by Sector 2009



Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand.*

Total Refined Petroleum Consumption (Final Demand) by Sector 2009

	BC		AB		SK		MB		RoC		Canada	
	petajoules	% of total	petajoules	% of total	petajoules	% of total	petajoules	% of total	petajoules	% of total	petajoules	% of total
Industrial	25.6	6.5	30.6	6.3	9.4	5.2	4.0	3.9	122.7	6.5	192.3	6.3
Transportation	313.9	79.3	330.8	67.8	104.2	57.3	75.5	73.8	1,420.9	74.9	2,245.3	73.2
Agriculture	7.4	1.9	29.1	6.0	37.1	20.4	14.7	14.4	34.1	1.8	122.4	4.0
Residential	0.8	0.2	0.1	0.0	0.7	0.4	0.1	0.1	62.0	3.3	63.6	2.1
Public Admin	3.4	0.9	6.4	1.3	5.0	2.8	2.3	2.3	34.1	1.8	51.2	1.7
Commercial/other	44.9	11.3	91.2	18.7	25.3	13.9	5.7	5.6	224.0	11.8	391.2	12.8
TOTAL	**395.9**	**100.0**	**488.2**	**100.0**	**181.8**	**100.0**	**102.3**	**100.0**	**1,897.8**	**100.0**	**3,066.0**	**100.0**

Notes: 1) Totals may not add up due to rounding. 2) Data refer to final consumption only and do not include refined petroleum used directly by producers, used for non-energy purposes or used to generate electricity.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand.*

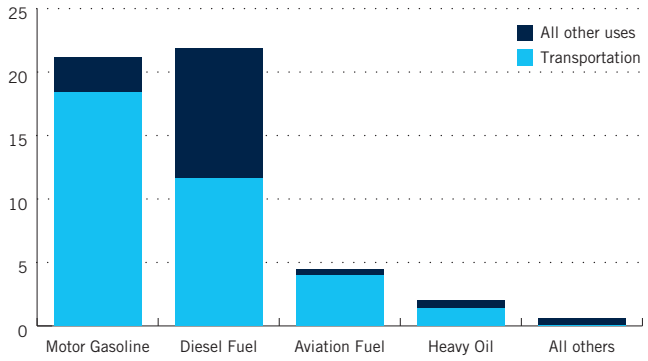
Refined Petroleum

CONSUMPTION BY FUEL TYPE

Overwhelmingly, the two most commonly used petroleum products in Canada are gasoline and diesel. For Canada as a whole, gasoline accounted for 48.2% of total refined petroleum consumption in 2009 and diesel 33.2%. In western Canada, however, the order was reversed; western Canadians consume more diesel fuel than any other type of refined petroleum product, including motor gasoline. In 2009, diesel accounted for 43.6% of final demand for petroleum products in the region, while gasoline made up 42.2% of final demand.

A significant share of diesel consumption in the West is in non-transportation-related activities, most notably in the commercial and other institutional sectors. In addition, gasoline use is more common in non-transportation applications on the Prairies compared to other provinces. Led by commercial and agricultural uses, between 11.5% (Manitoba) and 29.8% (Saskatchewan) of gasoline consumed in the prairie provinces is outside of the transportation sector.

Western Canadian Refined Petroleum Consumption by Type 2009 (GJ per capita)



Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Refined Petroleum Consumption (All Sectors) by Fuel Type 2009

		BC	AB	SK	MB	RoC	Canada
Motor gasoline	Total (terajoules)	162,271	195,132	84,686	51,982	983,730	1,477,973
	GJ/capita	36.4	53.2	82.3	42.6	42.1	43.8
	Non-transportation use (%)	5.8	12.4	29.8	11.5	4.6	7.5
Diesel fuel	Total (terajoules)	131,637	253,810	84,926	39,441	510,620	1,020,615
	GJ/capita	29.5	69.1	82.5	32.3	21.9	30.3
	Non-transportation use (%)	43.9	48.1	50.7	42.3	32.3	39.6
Aviation fuel	Total (terajoules)	58,052	34,879	3,153	8,389	135,721	240,220
	GJ/capita	13.0	9.5	3.1	6.9	5.8	7.1
	Non-transportation use (%)	4.8	20.0	11.7	20.7	19.0	15.7
Heavy fuel oil	Total (terajoules)	35,309	2,117	7,867	1,203	113,165	159,677
	GJ/capita	7.9	0.6	7.6	1.0	4.8	4.7
	Non-transportation use (%)	10.1	100.0	100.0	100.0	76.8	63.7
All others	Total (terajoules)	8,637	2,266	1,146	1,295	154,185	167,533
	GJ/capita	1.9	0.6	1.1	1.1	6.6	5.0
	Non-transportation use (%)	98.2	94.1	95.4	94.4	99.6	99.4
Total refined petroleum	Total (terajoules)	395,906	488,204	181,778	102,310	1,897,422	3,066,018
	GJ/capita	88.8	133.0	176.6	83.9	81.3	90.9
	Non-transportation use (%)	20.7	32.2	42.7	26.2	25.1	26.8

Note: "All other" petroleum products include kerosene/stove oil, light fuel oil, petroleum coke and aviation gasoline.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Electricity

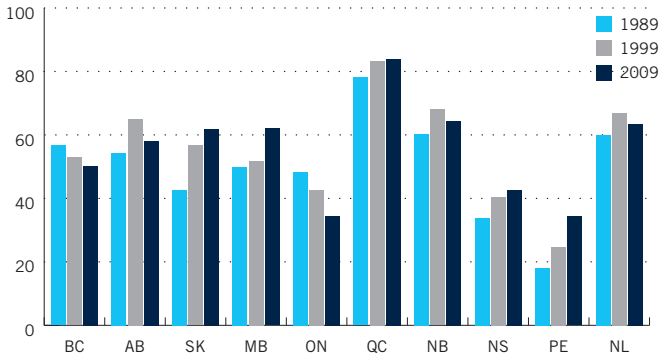
CONSUMPTION BY PROVINCE

Compared to other sources of energy, there is less variation in overall levels of per capita electricity consumption across Canada. In the western provinces, electricity final demand ranges from a low of 50 GJ/capita in BC to a high of 62 GJ/capita in Manitoba.

Unlike most other provinces, where per capita electricity consumption has been falling over the past decade, Manitoba has seen its electricity demand soar over that period. For Canada as a whole, per capita electricity consumption in 2009 was 8.6% lower than in 1999, but in Manitoba, per capita power consumption rose by 19.7% over that period. This increase in electricity use in Manitoba has come at the expense of natural gas, consumption of which has fallen by an equivalent amount since 1999. Electricity use in Saskatchewan has also risen since 1999, although in that case, the increase reflects growing consumption in that province of all forms of energy.

In BC, falling electricity consumption reflects a general trend toward energy efficiency and less per capita energy use in that province. In Alberta, the decrease in final demand for electricity has been more than offset by a corresponding increase in demand for natural gas.

Electricity Consumption (GJ per capita)



Note: Data refer to final consumption only and includes the use of both primary and secondary electricity.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

62.0 GJ/CAPITA

ELECTRICITY CONSUMPTION IN MB — THE HIGHEST IN THE WEST

Electricity Consumption (Final Demand) by Province 2009

	Total consumption			Per capita consumption		
	terajoules	% of total	% growth: 1999-2009	GJ/capita	% of national average	% growth: 1999-2009
British Columbia	224,184	12.4	5.6	50.3	93.5	-5.0
Alberta	213,178	11.8	10.9	58.1	108.1	-10.8
Saskatchewan	63,665	3.5	10.8	61.9	115.1	9.2
Manitoba	75,620	4.2	27.7	62.0	115.4	19.7
Ontario	448,865	24.8	-8.6	34.4	63.9	-19.5
Quebec	657,406	36.3	7.8	84.0	156.2	0.8
New Brunswick	48,274	2.7	-5.5	64.4	119.9	-5.3
Nova Scotia	40,000	2.2	6.1	42.6	79.2	5.5
Prince Edward Island	4,845	0.3	44.1	34.3	63.9	39.2
Newfoundland & Labrador	32,209	1.8	-9.9	63.4	117.9	-5.4
Canada	1,812,369	100	3.4	53.7	100	-6.8

Note: Data refer to final consumption only and includes the use of both primary and secondary electricity.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand* and Table 51-0001.

Electricity

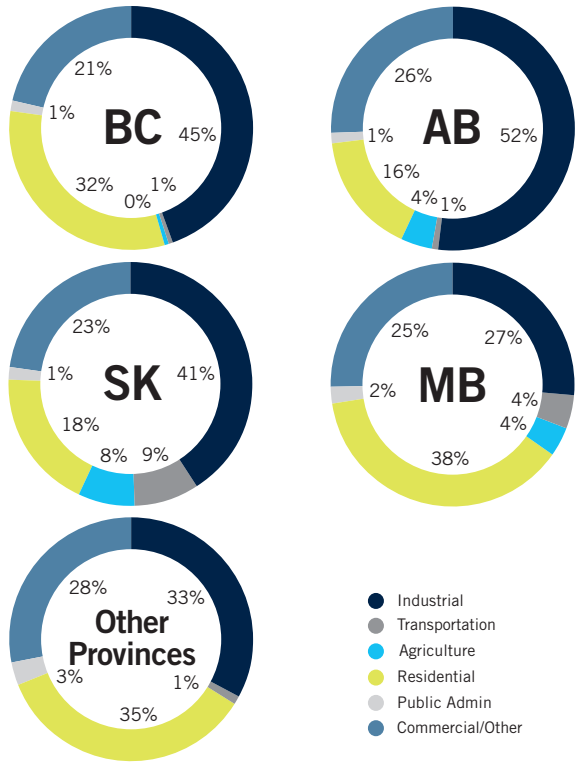
CONSUMPTION BY SECTOR

While electricity is consumed in most sectors, its use is primarily concentrated in three sectors – residential, industrial and commercial/public administration. Overall, industrial consumption accounts for the largest share of electricity demand. Nationally, industry uses 36.8% of all available electricity. That share is somewhat higher in western Canada (44.6%).

The one exception to this general trend is Manitoba. While Alberta (52.1%), Saskatchewan (41.0%) and British Columbia (44.7%) are all primarily industrial users of electricity (with the residential and commercial sectors accounting for most remaining consumption), the largest share of electricity use in Manitoba is in the residential sector, which makes up 37.6% of overall consumption in that province. Industrial uses make up only 26.6% of electricity use in Manitoba.

While the industrial sector is the largest overall consumer of electricity in most provinces, its share of total consumption has been gradually falling over the past decade, both in western Canada and outside the region. Residential and commercial electricity demand has largely offset this decline; national consumption has remained more or less stable since 2002, declining by only 3% in that timeframe.

Distribution of Electricity Consumption by Sector 2009



Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand.*

Total Electricity Consumption (Final Demand) by Sector 2009

	BC		AB		SK		MB		RoC		Canada	
	petajoules	% of total	petajoules	% of total	petajoules	% of total	petajoules	% of total	petajoules	% of total	petajoules	% of total
Industrial	100.1	44.7	111.1	52.1	26.1	41.0	20.1	26.6	410.5	33.2	667.9	36.9
Transportation	0.8	0.4	1.9	0.9	5.5	8.6	3.3	4.4	1.6	0.1	13.1	0.7
Agriculture	1.5	0.7	8.6	4.0	4.8	7.6	2.9	3.9	17.1	1.4	34.9	1.9
Residential	70.9	31.6	34.8	16.3	11.8	18.5	28.5	37.6	431.0	34.9	576.9	31.8
Public Admin	3.0	1.4	2.7	1.2	1.0	1.6	1.7	2.3	37.1	3.0	45.5	2.5
Commercial/other	47.8	21.3	54.2	25.4	14.5	22.8	19.0	25.2	338.4	27.4	474.0	26.2
TOTAL	**224.2**	**100.0**	**213.2**	**100.0**	**63.7**	**100.0**	**75.6**	**100.0**	**1,235.7**	**100.0**	**1,812.4**	**100.0**

Notes: 1) Totals may not add up due to rounding. 2) Data refer to final consumption only and includes the use of both primary and secondary electricity.
Source: Canada West Foundation calculations using data from Statistics Canada *Report on Energy Supply and Demand.*

Conclusion

Alberta and Saskatchewan are by far the largest per capita energy consumers in Canada. In fact, according to Alberta's 2008 *Provincial Energy Strategy*, Albertans are "among the highest per capita energy consumers on the globe."

The higher than average per capita consumption of energy in Alberta and Saskatchewan reflects the energy-intensive nature of energy production and transportation.

This record of heavy energy use stands in stark contrast to Manitoba and, especially, BC. In both cases, energy consumption is comparable to other provinces (except their western Canadian counterparts). BC is also experiencing one of the fastest per capita declines in overall energy consumption due in part to the decline of its energy-intensive forest industry. Only Ontario has seen a greater decrease in energy use – largely the result of a collapse in manufacturing sector activity since 2007.

It would be difficult to pin the disparities in energy consumption rates across western Canada on any one factor; there is a wide range of reasons for why non-industrial per capita energy consumption in Alberta and Saskatchewan is so much higher than in other provinces. Some factors include: a relatively dispersed population and larger vehicles driving up energy consumption in transportation; greater use of rail and pipeline transportation; and the relative importance of the (energy-intensive) agriculture sector in those provinces. Climate is also a factor; Alberta and Saskatchewan are home to Canada's northernmost major cities.

Perhaps the greatest opportunity, and the greatest policy challenge, regarding energy consumption in western Canada is the need to improve energy efficiency in the region. The benefits of doing so are clear: energy efficiency reduces energy demand which in turn lowers utility bills for consumers, reduces the need for costly new investments in electricity generation and can help to reduce greenhouse gas and particulate emissions in the region, which is desirable both from a climate change mitigation perspective as well as from a health perspective.

ENVIRONMENTAL IMPACT OF ENERGY

61.3%
of Alberta's greenhouse gas emissions are associated with energy production

71 tonnes
of CO_2 equivalent – SK's per capita GHG emissions in 2009, the highest of any province

48.9%
of GHG emissions in western Canada come from energy consumption, not production

38.7%
The decrease in surface water use for oilfield injection in Alberta from 1999 to 2009

58.8 million
cubic metres of water were injected into Alberta oilfields in 2009

21.1%
of Canada's greenhouse gas emissions come from fossil fuel production

104 hectares – the amount of disturbed land in the oil sands that has been certified reclaimed

Introduction

The production and consumption of energy of any type has an impact on the environment. It is common to think of environmental impacts almost exclusively in terms of greenhouse gas (GHG) emissions associated with the burning of fossil fuels. There are, however, other ways that energy systems have an impact on the environment. For example, the production of most forms of energy requires significant amounts of water to be diverted from rivers or other sources. The surface mining and tailings ponds that are part of oil sands extraction and the killing of birds and bats by wind turbines are additional examples of the negative environmental effects of energy production. And while hydroelectricity is emissions-free, the creation of new dams can flood entire valleys and have a profound effect on local ecosystems. Nuclear power is also emissions-free, but carries with it a waste disposal issue as well as concerns about potential nuclear accidents.

It is also a mistake to assume that the production of fossil fuels is responsible for most GHG emissions in Canada. In fact, the consumption of fossil fuels for transportation is the single largest source of GHG emissions in Canada.

In addition, when examining environmental impacts, it is important to consider the energy system as a whole. An illustration is the introduction of electric cars onto roadways across North America. While the operation of the vehicle itself may be emissions-free, more than half of all the electricity generated in the United States currently comes from coal.

A major barrier to the examination of the environmental impacts of energy use is that they can be difficult to quantify and useful data are often in short supply. Detailed information on greenhouse gas emissions is widely available, but statistics on water use and other forms of environmental impact are not. As a result, our understanding of the environmental effects of energy production is incomplete.

Greenhouse Gas Emissions

INTERNATIONAL COMPARISON

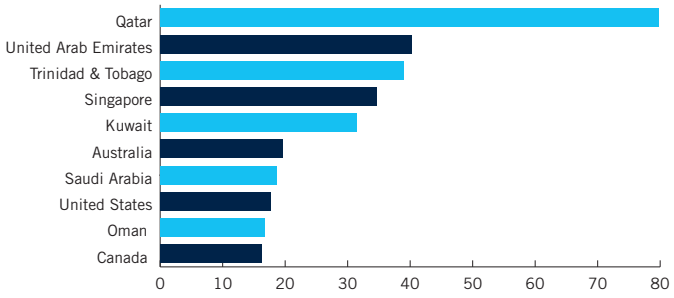
Largely because of its position as a leading global producer of oil and gas, Canada is one of the largest emitters of greenhouse gasses in the world. In terms of total emissions, Canada is the 7th largest source of CO_2 emissions worldwide, although it accounted for a relatively small 1.8% of total global emissions in 2009 and ranked far behind China and the United States which together produced 43.2% of global CO_2 emissions that year.

Canada is also a major emitter of GHGs on a per capita basis. Excluding countries with fewer than one million people, Canada was the 10th largest per capita producer of CO_2 emissions in 2009. By this measure, each Canadian produces on average only slightly fewer tonnes of CO_2 equivalent than the average resident of the United States. Many of the world's major oil producers also rank in the top ten in terms of per capita emissions.

1.8%

CANADA'S SHARE OF GLOBAL GHG EMISSIONS FROM ENERGY PRODUCTION AND CONSUMPTION

Per Capita Energy-Related Carbon Dioxide Emissions by Country 2009 (tonnes of CO_2 equivalent)



Note: Includes only carbon dioxide emissions from the consumption of energy.
Source: US Energy Information Administration.

Total Energy-Related Carbon Dioxide Emissions by Country 2009

		million tonnes of CO_2 equivalent	% of world total
01	**China**	7,706.8	25.4
02	**United States**	5,424.5	17.9
03	**India**	1,591.1	5.2
04	**Russia**	1,556.7	5.1
05	**Japan**	1,097.0	3.6
06	**Germany**	765.6	2.5
07	**Canada**	541.0	1.8
08	**Iran**	528.6	1.7
09	**South Korea**	528.1	1.7
10	**United Kingdom**	519.9	1.7

Note: Countries and island states with a population of less than 1 million are not included in this figure. Includes only carbon dioxide emissions from the production and consumption of energy.

Source: US Energy Information Administration.

Greenhouse Gas Emissions

BY PROVINCE

Alberta and Saskatchewan are the source of a significant share of Canada's overall GHG emissions. Alberta alone accounted for one third of Canada's total GHG output in 2009 with an additional 10.6% coming from Saskatchewan. These large shares are primarily because of fossil fuel production and the prevalence of coal- and gas-fired electricity generation in those provinces.

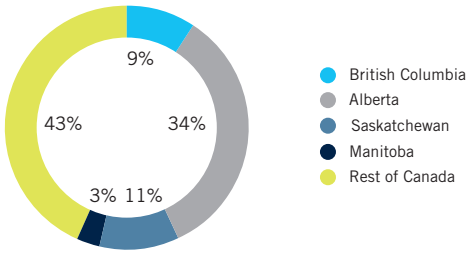
On a per capita basis, the gap between Alberta and Saskatchewan on the one hand, and the rest of Canada on the other, is even more pronounced. Saskatchewan is Canada's largest GHG emitter on a per capita basis at 71.0 tonnes of CO_2 equivalent in 2009. After Alberta (63.7 tonnes), the next largest per capita emitter was New Brunswick, which produced about one third the per capita emissions of Saskatchewan.

For their part, BC and Manitoba are relatively small emitters of GHGs on a per capita basis in part because both provinces are large producers of hydroelectricity.

54.7%

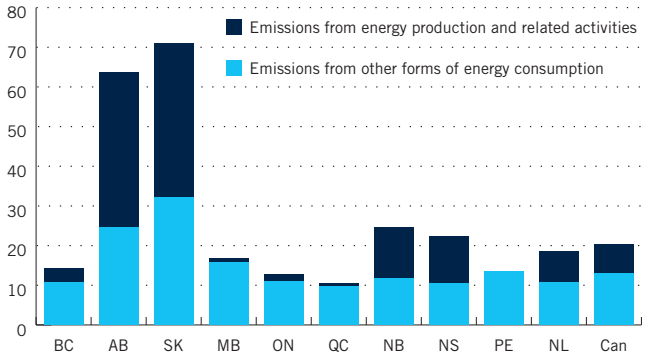
OF SASKATCHEWAN'S ANTHROPOGENIC GHG EMISSIONS COME FROM ENERGY PRODUCTION AND RELATED ACTIVITIES

Share of Canada's total Greenhouse Gas Emissions 2009 (%)



Source: Canada West Foundation calculations using data from Environment Canada *National Inventory Report: Greenhouse Gas Sources and Sinks in Canada 1990-2009.*

Per Capita GHG Emissions by Province 2009 (tonnes of CO_2 equivalent)



Note: "Energy production and related activities" includes electricity and heat generation; fossil fuel production and refining; mining and oil and gas extraction; and fugitive sources such as natural gas venting and flaring.
Source: Canada West Foundation calculations using data from Environment Canada *National Inventory Report: Greenhouse Gas Sources and Sinks in Canada 1990-2009.*

Greenhouse Gas Emissions

GROWTH TRENDS

Total GHG emissions in Canada were steady from 2003 to 2008, but fell sharply in 2009 as the recession drove emissions down to levels seen a decade earlier. Although driven by economic and not policy factors, this decrease represents the first significant step toward Canada meeting its GHG emissions targets under the Copenhagen Accord.

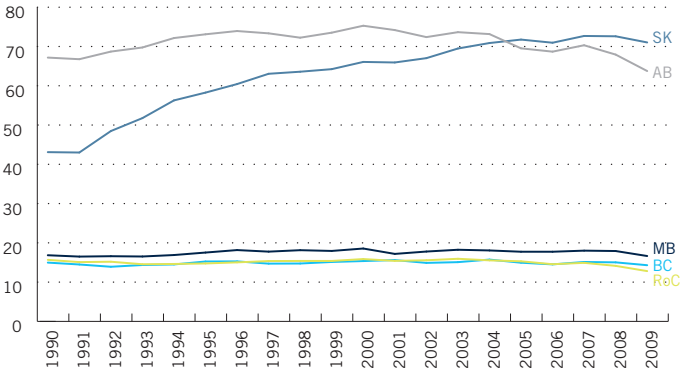
The pattern of total GHG emissions in Canada over the past decade has been growing emissions in fossil fuel-producing provinces and declining emissions elsewhere. Saskatchewan and Alberta have been among the fastest-growing sources of emissions (along with Newfoundland and Labrador), driven by the expansion of energy production as well as growth in transportation-related emissions in Saskatchewan.

On a per capita basis, however, greenhouse gas emissions across Canada have fallen by an average of 1.0% per year since 1999, indicating decreasing emissions intensity. Saskatchewan has been the fastest-growing source of per capita emissions in Canada over that period. Alberta, by contrast, has seen the second largest decrease in per capita emissions of any province (behind Ontario), due to a combination of factors, including strong population growth and production efficiencies in the oil sands.

THE AVERAGE ANNUAL DECREASE IN GHG EMISSION IN MB BETWEEN 1999 AND 2009 WAS

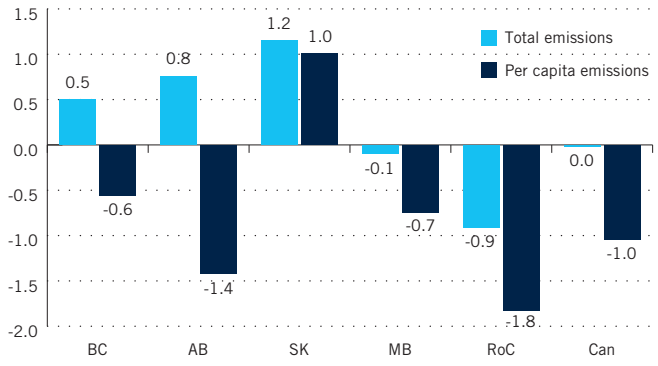
0.1%

Per Capita GHG Emissions by Province
(tonnes of CO_2 equivalent)



Source: Environment Canada *National Inventory Report: Greenhouse Gas Sources and Sinks in Canada 1990-2009.*

Average Annual Growth in GHG emissions 1999 to 2009 (%)



Source: Canada West Foundation calculations using data from Environment Canada *National Inventory Report: Greenhouse Gas Sources and Sinks in Canada 1990-2009.*

Greenhouse Gas Emissions

FOSSIL FUEL PRODUCTION

The growth in overall greenhouse gas emissions in western Canada is closely tied to the development of the fossil fuel industry in Alberta and Saskatchewan. Fossil fuel extraction and processing are emissions-intensive activities. As the oil and gas industry expands in western Canada, its contribution to national GHG emissions is rising as well.

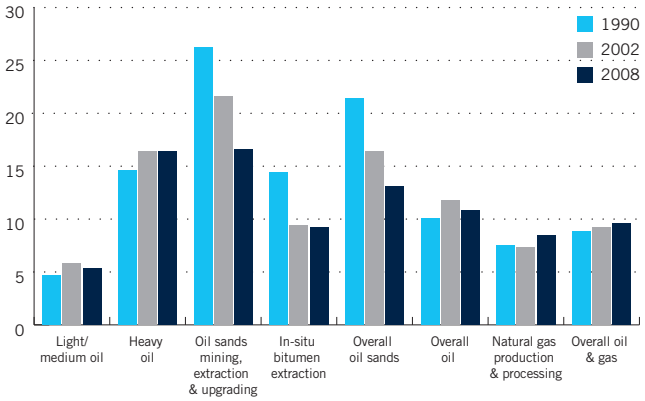
While the expansion of oil sands-based crude oil production is driving up GHG emissions in Canada, it is important to note that the gap in emissions from conventional and unconventional petroleum deposits is narrowing. As reserves of easily-removable conventional oil dwindle, the amount of energy needed to recover what conventional crude oil remains is rising. As a result, the emissions intensity of conventional oil is higher today than it was in the early 1990s.

By contrast, there have been considerable improvements in lowering the carbon footprint of oil sands extraction. Oil sands production in 2008 had, on average, lower emissions intensity than conventional heavy crude production.

38.8%

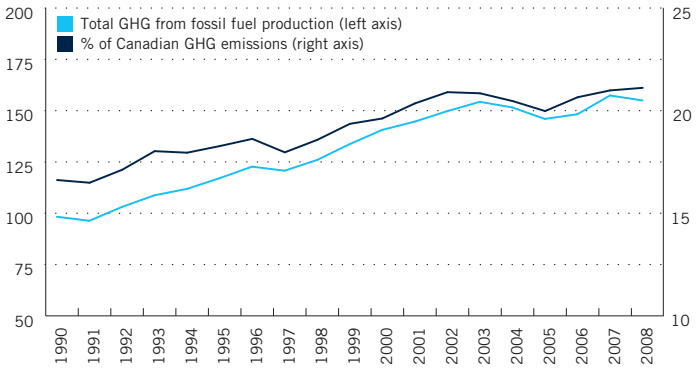
DROP IN EMISSIONS INTENSITY OF OIL SANDS PRODUCTION FROM 1990 TO 2008

Emissions Intensity of Fossil Fuel Production by Type (g of CO_2 equivalent per megajoule)



Notes: 1) Intensities are based on total subsector emissions and energy use reported by Statistics Canada. They represent overall averages, not facility intensities.
2) Includes fuel combustion, flaring, venting and fugitives.
Source: Environment Canada *National Inventory Report: Greenhouse Gas Sources and Sinks in Canada 1990-2008.*

Contribution of Fossil Fuel Production to Canadian GHG Emissions (megatonnes of CO_2 equivalent)



Source: Canada West Foundation calculations using data from Environment Canada *National Inventory Report: Greenhouse Gas Sources and Sinks in Canada 1990-2008.*

Greenhouse Gas Emissions

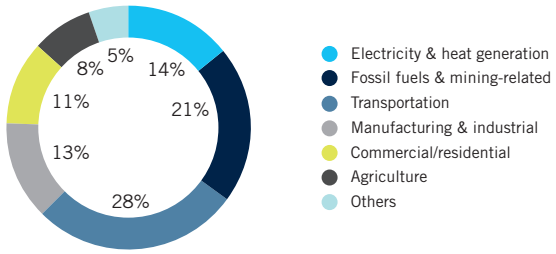
BY SECTOR

In BC and Manitoba, as with most other provinces, energy consumption is a much larger source of GHG emissions than is energy production. Energy consumption accounted for three quarters of GHG emissions in BC in 2009 and more than 95% of emissions in Manitoba. By contrast, more than half of the GHG emissions from Saskatchewan came from energy production while in Alberta the figure was 61.3%.

Energy consumers in BC and Manitoba generate fewer GHGs on a per capita basis compared to those in Alberta and Saskatchewan.

Among energy-consumption sectors, transportation – motor vehicle transportation in particular – is the single largest source of greenhouse gas emissions across western Canada. Agriculture is a relatively large source of emissions in the prairie provinces. Because of its abundant hydroelectricity and relative lack of fossil fuels, Manitoba emits almost no GHGs in the production of energy.

Canadian GHG Emissions by Sector 2009



Source: Canada West Foundation calculations using data from Environment Canada *National Inventory Report: Greenhouse Gas Sources and Sinks in Canada 1990-2009.*

4.7%

OF MB'S GHG EMISSIONS COME FROM ENERGY PRODUCTION

Greenhouse Gas Emissions by Province and by Source 2009

	BC			AB			SK			MB			RoC		
	MT of CO_2 eq	% of provincial emissions	T per capita	MT of CO_2 eq	% of provincial emissions	T per capita	MT of CO_2 eq	% of provincial emissions	T per capita	MT of CO_2 eq	% of provincial emissions	T per capita	MT of CO_2 eq	% of provincial emissions	T per capita
ENERGY PRODUCTION															
Electricity & heat generation	1.2	1.9	0.28	48.3	20.6	13.16	14.8	19.7	14.38	0.2	0.8	0.13	33.4	11.2	1.40
Fossil fuels & mining-related	14.5	22.7	3.25	95.1	40.6	25.91	25.2	33.5	24.45	0.8	3.9	0.66	9.2	3.1	0.38
ENERGY CONSUMPTION															
Transportation	24.6	38.6	5.52	35.2	15.0	9.59	14.2	18.9	13.80	7.0	34.6	5.76	109.0	36.5	4.58
Manufacturing & industrial	9.9	15.5	2.22	22.3	9.5	6.08	2.1	2.9	2.08	2.1	10.5	1.75	52.4	17.5	2.20
Commercial/ residential	7.5	11.8	1.69	14.2	6.1	3.87	3.7	5.0	3.62	2.5	12.5	2.08	49.0	16.4	2.06
Agriculture	2.1	3.4	0.48	17.0	7.3	4.63	12.0	16.0	11.66	6.7	33.0	5.49	18.2	6.1	0.76
Waste	3.9	6.1	0.87	1.7	0.7	0.46	0.7	0.9	0.69	0.9	4.3	0.71	14.8	5.0	0.62
Other	0.0	0.0	0.00	0.2	0.1	0.05	0.4	0.5	0.35	0.1	0.4	0.06	12.9	4.3	0.54
TOTAL	**63.8**	**100**	**14.30**	**234.0**	**100**	**63.75**	**73.1**	**97.43**	**71.03**	**20.3**	**100**	**16.64**	**298.8**	**100**	**12.55**

Source: Canada West Foundation calculations using data from Environment Canada *National Inventory Report: Greenhouse Gas Sources and Sinks in Canada 1990-2009.*

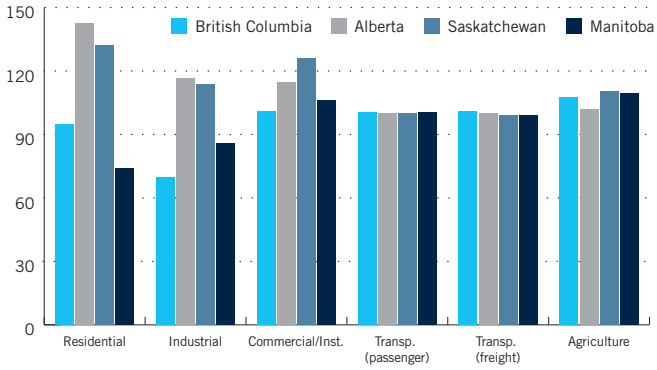
Greenhouse Gas Emissions

GHG INTENSITY & TRENDS

The greatest variation in provincial GHG intensity occurs in sectors where different forms of energy are easily substitutable, but availability varies. In the residential, commercial and industrial sectors, natural gas, light fuel oil and hydroelectricity can all, to some degree, be used for similar purposes. Differences in availability contribute to the greater range in emissions intensity in those sectors in western Canada. Emissions intensity is lower in BC and Manitoba (where hydroelectricity use is more widespread) and higher in Alberta and Saskatchewan (where natural gas and coal use is more common).

With a few exceptions, there has been a general decrease in GHG intensity over time in most provinces (and in most sectors). This decrease is attributable to several factors including technological advancement and efficiency gains, as well as the increased use of cleaner energy. For example, BC and Manitoba have seen a significant decrease in GHG intensity in the residential sector because hydroelectricity's share of overall energy consumption has been climbing. In BC, electricity accounted for 37.4% of total residential energy use in 1990, rising to 46.6% by 2008. In Manitoba, the increase was even more pronounced: from 37.8% in 1990 to 56.5% in 2008.

GHG Intensity in Western Canada 2008
(as a % of the Canadian average)



Source: Canada West Foundation calculations using data from Natural Resources Canada.

31.5%

DROP IN RESIDENTIAL EMISSIONS INTENSITY IN MB SINCE 1990

Greenhouse Gas Emissions Intensity by Province and Sector (tonnes of CO_2 equivalent per terajoule of energy)

	Residential			Industrial			Commercial/Institutional			Transportation (passenger)			Transportation (freight)			Agriculture		
	1990	2008	% change	1990	2008	% change	1990	2008	% change	1990	2008	% change	1990	2008	% change	1990	2008	% change
British Columbia	32.7	27.7	-15.2	24.2	24.0	-0.7	31.1	29.2	-6.2	69.3	68.1	-1.6	72.1	71.5	-0.8	58.4	64.2	9.9
Alberta	43.9	41.7	-5.0	40.9	40.0	-2.3	36.3	33.1	-8.7	69.3	68.0	-1.9	70.4	70.9	0.6	61.4	60.8	-1.0
Saskatchewan	42.1	38.5	-8.5	39.0	39.1	0.3	30.1	36.4	21.0	69.5	67.8	-2.4	71.8	70.2	-2.3	64.3	65.7	2.3
Manitoba	31.6	21.7	-31.5	32.5	29.5	-9.2	34.0	30.7	-9.7	69.6	68.1	-2.2	71.6	70.2	-1.9	57.2	65.4	14.4
Ontario	34.8	34.4	-1.1	44.7	45.3	1.4	28.6	26.8	-6.4	69.2	67.9	-2.0	70.8	70.2	-0.9	54.2	51.4	-5.2
Quebec	22.7	13.9	-38.7	29.0	20.2	-30.1	23.0	24.7	7.5	69.2	67.5	-2.5	71.1	70.8	-0.4	48.7	54.3	11.5
Atlantic	38.4	25.2	-34.4	37.6	31.9	-15.0	35.6	39.2	10.0	69.8	68.1	-2.5	72.7	71.9	-1.1	61.2	60.4	-1.3

Notes: 1) Data are not available for individual Atlantic Provinces. 2) Figures represent final consumption only and exclude all emissions associated with electricity generation.
Source: Natural Resources Canada.

Water Use in Energy Production

OVERVIEW

Water is a critical component of nearly every form of energy production. It is used in the production of the raw materials from which energy is derived – oil, gas, coal, uranium and other goods – as well as in the transformation of raw materials into a form useable by consumers. This transformation includes the use of water as a source of steam and a coolant in thermal and nuclear power plants; the process of refining fossil fuels; as well as the direct production of electricity through hydroelectric dams.

In all cases, a significant amount of water is used in the production of energy. However, it is difficult to arrive at precise figures on water use because water use can vary dramatically depending on prevailing local conditions and recycling efforts. In general, the oil and gas sector is a significant user of water, but this is at least in part because of the sheer volume of energy produced. Other forms of energy, including biofuels and hydroelectricity (through evaporation from reservoirs) consume much more water per unit of energy produced.[1] Shale gas and shale oil deposits can also be significant net users of water.

[1] **Source:** World Economic Forum *Energy Vision Update 2009 – Thirsty Energy: Water and Energy in the 21st Century* (www2.cera.com/docs/WEF_Fall2008_CERA.pdf).

Gas and Liquid Fuels Value Chain

Water Use

RAW MATERIALS

OIL

Traditional Oil: 3-7 litres per GJ
(0.8-2.0 gallons per MMBtu)

Enhanced Oil Recovery: 50-9,000 litres per GJ
(14-2,500 gallons per MMBtu)

Oil Sands:* 70-1,800 litres per GJ
(20-500 gallons her MMBtu)

BIO FUELS

Corn: 9,000-100,000 litres per GJ
(2,500-29,000 gallons per MMBtu)

Soy: 50,000-270,000 litres per GJ
(14,000-75,000 gallons per MMBtu)

Sugar: N/A

COAL

5-70 litres per GJ
(1.5-20 gallons per MMBtu)

GAS

Traditional Gas: Minimal

Shale Gas: 36-54 litres per GJ
(10-15 gallons per MMBtu)*

TRANSFORMATION

OIL REFINING

25-65 litres per GJ
(7-18 gallons per MMBtu)

Ethanol: 47-50 litres per GJ
(13-14 gallons per MMBtu)

Biodiesel: 14 litres per GJ
(4 gallons per MMBtu)

Coal-to-liquids: 140-220 litres per GJ
(40-60 gallons per MMBtu)

Natural Gas Processing: 7 litres per GJ
(2 gallons per MMBtu)

Electricity Industry Value Chain

Water Use

RAW MATERIALS

THERMOELECTRIC FUELS

Coal: 20-270 litres per MWh
(5-70 gallons per MWh)

Oil, Natural Gas
(Wide variance, see oil value chain)

Uranium (nuclear): 170-570 litres per MWh
(45-150 gallons per MWh)

HYDROELECTRIC

GEOTHERMAL

SOLAR

WIND

TRANSFORMATION

THERMOELECTRIC GENERATION WITH CLOSED-LOOP COOLING

720-2,700 litres per MWh
(190-720 gallons per MWh)

Evaporation Loss: Averages: 17,000 litres per MWh
(4,500 gallons per MWh)

5,300 litres per MWh
(1,400 gallons per MWh)

Concentrating Solar: 2,800-3,500 litres per MWh
(750-920 gallons per MWh)

Photovoltaic: Minimal

Wind: Minimal

* CERA estimate.
Source: World Economic Forum *Energy Vision Update 2009 – Thirsty Energy: Water and Energy in the 21st Century.*

Water Use in Energy Production

OIL PRODUCTION

The use of water in oil sands recovery in Alberta has garnered significant public attention in recent years. Although water use varies considerably from one deposit to the next depending on factors such as the use of recycling technology and the nature and maturity of the field, it is estimated that production of one cubic metre of synthetic crude oil (upgraded bitumen) by surface mining requires 2.5 cubic metres of water. Water demands for in situ production are lower – an estimated 0.5 cubic metres per cubic metre of synthetic crude oil.[2]

Innovation in both conventional crude oil production as well as oil sands recovery has dramatically reduced the amount of water consumed by Alberta's oil industry. The amount of surface water used in oilfield injection in Alberta has fallen in half since 1989. At the same time, use of saline groundwater, much of which is produced incidentally in the process of oil and gas recovery and then reinjected into the field, is increasing.

[2] Royal Society of Canada, *Environmental and Health Impacts of Canada's Oil Sands Industry*. December 2010.

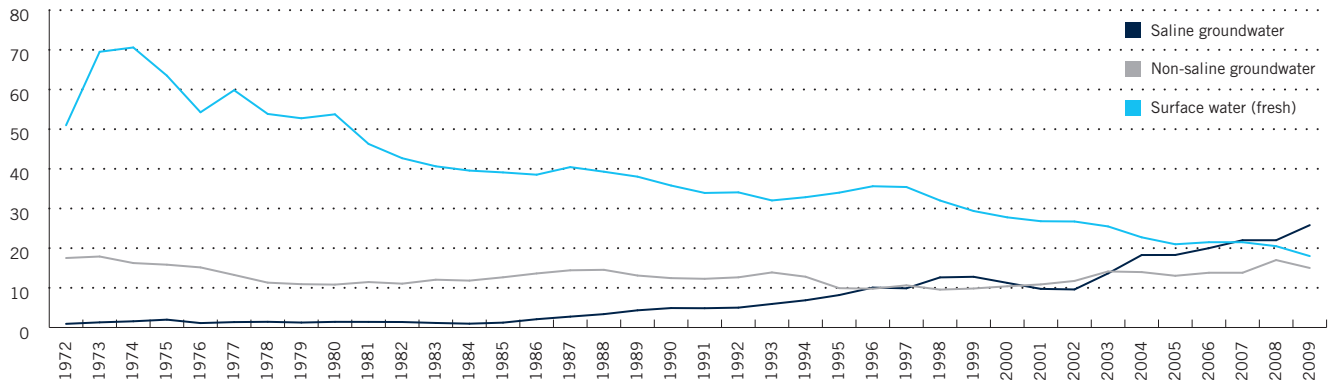
13.2%

DECREASE IN WATER USE FOR OILFIELD INJECTION IN ALBERTA FROM 1999 TO 2009

56.1%

OF WATER USED IN OILFIELDS IN ALBERTA IS FRESH (NON-SALINE) WATER

Water Use for Oilfield Injection Purposes in Alberta (millions of cubic metres)



Source: Alberta Environment, Geowa Information Technologies Ltd. Data for 2006-2009 are estimated by the Canada West Foundation based on information from Alberta Environment.

Land Use

OVERVIEW

All forms of energy production are associated with some disturbance of land, whether in the construction of the required machinery and equipment or in the direct production of energy itself. Large-scale hydro projects have perhaps the greatest, and most irreversible, impact on land through the disturbance of waterways and forest/habitat loss associated with flooding ravines to create reservoirs.

Oil sands production, especially open-pit mining, is also associated with significant land disturbance. Approximately 662 km^2 of land in northeastern Alberta has been disturbed by oil sands mining operations, equivalent to about 97% of the size of the city of Edmonton.[3] An estimated 4,800 km^2 of land in the area could be surface mined.[4]

Land use in oil sands operations includes the creation and maintenance of tailings ponds – man-made containers where waste water from oil sands operations is stored to allow particulate ("tailings") to settle and clean water to be recycled. Unfortunately, the settling process often takes 30 to 40 years to be completed, meaning that tailings ponds can dot the landscape around oil sands developments for decades before the land can be reclaimed. At present, tailings ponds cover an estimated 170 km^2 of land in Alberta and hold 5.5 billion m^3 of tailings.

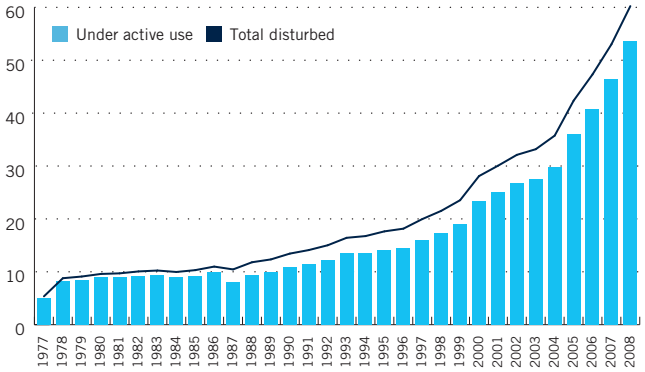
[3] Source: CAPP, *The Facts on Oil Sands*, June 2011.

[4] *Ibid.*

662km²

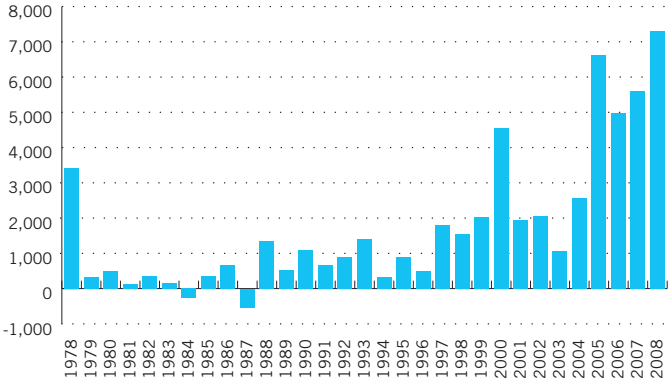
LAND IN NORTHEAST ALBERTA DISTURBED BY OIL SANDS MINING

Cumulative Land Use in the Alberta Oil Sands (000s of hectares)



Source: Royal Society of Canada *Environmental and Health Impacts of Canada's Oil Sands Industry.*

Annual Land Disturbance in the Oil Sands (hectares)



Source: Royal Society of Canada, *Environmental and Health Impacts of Canada's Oil Sands Industry.*

Land Use

RECLAMATION

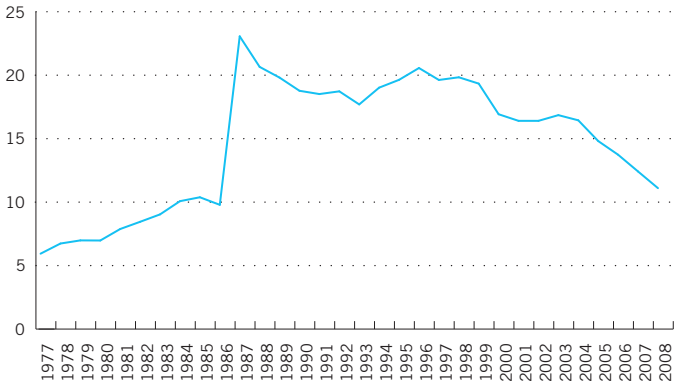
The Government of Alberta requires that post-mining landscapes in the province be returned to "an equivalent land capability." Based on industry applications and regulatory approvals, this definition implies that post-mining landscapes will be similar to undisturbed boreal forest.[5] However, there is no specific requirement for this to be so. In fact, differing interpretations of these regulatory standards, and of terms such as "restoration" and "reclamation," are a source of ongoing debate.

Since the mid-1990s, land disturbance from oil sands activities has rapidly outpaced reclamation efforts. In part this is because mining is a long-term activity and reclamation is unlikely to keep pace with development in the early stages of projects. In addition, companies may be hesitant to apply for certification until they are sure the land will no longer be needed.

As of 2008, just 104 hectares of land has been certified by the province as reclaimed. A larger share, representing about 11% of disturbed land, has been self-reported by the industry as being reclaimed. However, this share is based on varying interpretations of what constitutes a reclaimed landscape.[6]

[5] Royal Society of Canada: *Environmental and Health Impacts of Canada's Oil Sands Industry*. December 2010.
[6] *Ibid.*

Total Self-Reported Reclaimed Land in the Oil Sands
(% of disturbed land)



Source: Royal Society of Canada, *Environmental and Health Impacts of Canada's Oil Sands Industry.*

0.2%

OF LAND DISTURBED BY OIL SANDS DEVELOPMENT HAS BEEN *CERTIFIED* RECLAIMED

Oil Sands Disturbance and Reclamation (hectares)

	EPEA Approved Footprint	Mine Site Footprint	Plant Site Footprint	Total Active Footprint	Cleared	Disturbed: Used for Mine or Plant Purposes	Ready for Reclamation: No Longer Used for Mine or Plant Purposes	Soils Placed (Terrestrial & Wetlands & Aquatics)	Permanent Reclamation (Terrestrial)	Permanent Reclamation (Wetlands & Aquatics)	Temporary Reclamation (Terrestrial)	Certified
2009	134,155	63,285	4,045	67,330	18,735	41,362	913	1,090	3,494	1,158	863	104
2010	135,157	67,970	3,527	71,497	17,055	46,899	394	1,534	3,643	1,192	780	104

Note: EPEA Approved Footprint is the total project area approved by Alberta Environment under the Environmental Protection and Enhancement Act.
Source: Government of Alberta, Ministry of Environment and Water.

Conclusion

Risks and Opportunities

As global awareness of the impact of greenhouse gas emissions on climate change grows, international attention has increasingly focused on ways to reduce both the intensity and the volume of those emissions. On a positive note, this focus has led to tremendous investments in renewable energy sources, abatement technologies and conservation efforts around the globe. It has also led to marked decreases in GHG emissions and emission intensity in many parts of the world.

On a more negative note, this awareness has cast a somewhat harsh spotlight on major global energy producers which are among the leading sources of greenhouse gasses (on a per capita basis). This is true of Canada, and Alberta's oil sands in particular. To be sure, Canadian producers have made considerable progress in lowering GHG intensity over the years. However, these improvements will not be enough to offset the increase in overall emissions levels expected as oil sands activity increases.

It is important to remember that energy production in western Canada is a response to regional, national and global demand. While energy producers do have a pivotal role to play in reducing overall emissions levels, energy consumers bear at least as much responsibility, if not more, given that they account for about two thirds of national emissions.

Finally, it is critical that discussions on the environmental impact of energy production in western Canada not be limited to greenhouse gasses. All types of energy production have some impact on the environment, whether through the manufacture of equipment (wind and solar), ecosystem loss (hydroelectricity), water use (biofuels), toxic waste disposal (nuclear) and so on. The whole range of environmental impacts, as well as the whole range of actors in the energy system, need to be part of a regional and national discussion.

Final Thoughts

Looking Ahead: Forces Driving Future Energy Policy in Western Canada

The future of the energy sector in western Canada depends heavily on the interplay between two concurrent global trends. These trends will, in sometimes competing and sometimes complementary fashion, affect the outlook for energy production, distribution and consumption around the world, including in the four western provinces.

The first of these global forces is the shifting pattern of energy demand growth around the world. Canada lacks the domestic market (and, in some cases, the required infrastructure) to consume all the energy produced in the western provinces. Western Canadian producers have long relied on demand from the United States to support current production, and future expansion, of the region's resources.

Indeed, the US has been a good customer. Energy consumption in the US has fuelled the growth of the oil and gas industries in western Canada; demand for electricity has contributed to the development of hydroelectric capacity; and foreign direct investment from the US has contributed the capital required to build the energy production and distribution system. As a result, US energy demand has directly contributed to economic growth and prosperity in the West.

Looking forward, however, there is some uncertainty in terms of how much US energy demand can continue to fuel the growth of the oil and gas industry in western Canada. One issue is the outlook for future energy consumption in the US, which suggests only modest growth in the years ahead. Another is US energy policy. Reducing dependence on foreign oil, especially that which is sourced from undemocratic or unstable regimes overseas, is a longstanding policy goal in the US. However, the potential implication of this policy on demand for western Canadian energy is far from clear.

On the one hand, to the extent that the US turns its attention to continental energy markets and substitutes overseas oil with energy from stable suppliers like Canada, the prospects for western Canadian energy producers improve considerably. On the other hand, US efforts to develop domestic energy supplies, including shale oil gas reserves, could reduce demand for oil and gas from the western provinces, affecting future development of the region's resources.

At the same time, tremendous growth in energy demand in China and other developing Asian markets is redrawing the map in terms of global energy flows. For example, according to the US Energy Information Administration, developing Asian markets are expected to account for nearly 60% of all growth in crude oil demand worldwide between 2010 and 2035. This booming demand is creating tremendous interest in western Canadian energy deposits, evidenced by the surge in foreign direct investment activity from Asia in oil and gas extraction projects in BC and Alberta. It has also led to numerous proposals within western Canada aimed at improving the region's access to oil and gas markets in Asia. There has also been increased interest from Asian nations in Saskatchewan's uranium as they seek to expand their nuclear capacity.

The second global force that will shape the future of energy policy in western Canada is growing recognition worldwide of the need to reduce the environmental footprint associated with energy consumption. While climate change attracts the most public attention, it is by no means the only environmental issue associated with energy. Other environmental issues include water use and contamination, as well as habitat and ecosystem loss.

On the production side, while western Canada is blessed with an abundance of energy resources, it also faces the challenge that the oil sands, arguably the region's most valuable energy asset, generates a large environmental footprint relative to most other crude oil deposits.

As a result, the oil sands have become a lightning rod for criticism from environmental groups, both in Canada and internationally, that could affect access to foreign markets. In particular, efforts to expand the pipeline infrastructure to send oil sands oil to markets in the US and Asia have met with stiff resistance from a range of stakeholders, including some in the US government. If unaddressed – whether through advocacy or enhanced impact-mitigation efforts – these criticisms could affect the long-term expansion and development of the resource.

In addition, the need to meet environmental imperatives will drive up the cost of producing energy. This is a particular concern in western Canada where the production costs associated with oil sands recovery and unconventional gas extraction are already high compared to many other deposits around the world. Compliance with stricter environmental standards will further drive up production costs. Rising cost pressures will intensify the need for productivity improvements in western Canadian energy production in order to keep the industry strong.

Environmental issues could also have a long-term impact on the mix of energy types produced in western Canada. To the extent that obligations created under international agreements or domestic policies (such as regulations on GHG emissions or carbon taxes) affect relatively high-emission energy sources, there could be a gradual shift in western Canada toward increased extraction and development of relatively clean-burning fuels such as natural gas, or renewable and alternative energies such as hydroelectricity and wind power.

As global pressure to reduce carbon emissions and other environmental impacts mounts, there is no doubt that Alberta and Saskatchewan – Canada's largest producers of fossil fuels – will be the provinces most affected. By the very nature of fossil fuel production, those provinces will always be large emitters of GHGs compared to other parts of the country. Nothing short of shutting down oil, gas and coal production, as well as secondary electricity generation, would change that fact.

However, it is important to note that fossil fuels are produced in response to consumer demand; in most wealthy countries, including in much of Canada, everyday consumers are the largest single source of energy-related greenhouse gas emissions. As such, a significant share of the pressure to reduce GHG emissions and other environmental impacts of energy consumption may come in the form of measures aimed at improving energy efficiency and reducing consumption intensity.

Responding to Global Trends: Shaping a More Prosperous and Sustainable Energy Future for Western Canada

The two global trends identified above are shaping the future environment in which the western Canadian energy system will operate.

The question is: do the federal and provincial energy policies currently in place adequately address the issues that arise out of these global trends? In other words, what more could the western provinces and the federal government do to better prepare for the future global environment in which energy production and consumption will take place? How could our response be better?

There is no quick-and-easy answer to this question. The effectiveness of government policies can only be measured in terms of the progress they make toward meeting specific objectives. In turn, these objectives only make sense if they are part of a coherent energy strategy.

Unfortunately, energy policy in Canada – especially at the federal level – is something of a hodge-podge rather than a clear, consistent and integrated strategy. In this regard, the western provinces have done a much better job of articulating where they want to go with regard to their distinct energy futures and what needs to be done to get there than the federal government. In addition, the efforts of BC, Alberta and Saskatchewan to coordinate and cooperate on energy issues under the banner of the New West Partnership should be applauded. Nonetheless, a proactive Canadian energy strategy built from the provinces up, but aligned with clearly defined national objectives, is the missing piece of this puzzle (as is the inclusion of Manitoba in the cooperative efforts of BC, Alberta and Saskatchewan).

Appendix

SELECT FEDERAL & PROVINCIAL ENERGY POLICIES

The production and use of energy in Canada is a complex topic that brings a wide range of government departments into play such as those responsible for Aboriginal affairs, the environment, trade, taxation and, of course, natural resources and energy. For this reason, even though the provinces have constitutional jurisdiction over most natural resources, the federal government is also an active player in developing and implementing various energy-related policies.[1] This, combined with the fact that energy policy is a moving target that evolves over time, make it difficult to present a comprehensive account of energy policy.

This appendix documents a selection of the energy policies in place (or recently in place) at the federal level and at the provincial level within western Canada. While this appendix does not cover everything, it provides a sense of the assortment of energy policies that are currently seeking to shape energy production and use in western Canada.

Select Federal Energy Policies

Environmental Stewardship Policies

In the 2008 Speech from the Throne, Governor General Michaëlle Jean announced the federal government's green energy target; by 2020, 90% of all electricity generated in Canada is to come from non-greenhouse-gas-emitting sources. Non-emitting sources include nuclear, clean coal, wind and hydroelectricity. According to Statistics Canada, approximately 75% of all electricity generated in 2010 fell into this category.

The federal government agreed to a 17% reduction in greenhouse gas (GHG) emissions below the 2005 level by 2020 as part of the 2009 Copenhagen Accord, although that commitment is not legally binding.

In February 2009, the federal governments of the US and Canada announced a joint US-Canada Clean Energy Dialogue. The dialogue is to result in continental cooperation in developing and implementing clean energy technologies, building a better electricity grid that incorporates clean energy and expanding clean energy research and development (Canada 2011a).

Alternative Energy

Under its 2009 economic stimulus budget, the federal government created a Clean Energy Fund for the demonstration of existing technologies. More than $600 million was committed under the fund to different clean energy projects. Within that total, $466 million went to carbon capture and storage (CCS) projects, while another $146 million went to funding a variety of clean energy projects across Canada (Natural Resources Canada 2011a).

The Program of Energy Research and Development (PERD) is an ongoing interdepartmental program operated by Natural Resources Canada. Federal government departments interested in researching and developing sustainable energy technologies are eligible for funding under this program (Natural Resources Canada 2010a).

The ecoENERGY Technology Initiative, valued at $230 million, was launched in 2008. The fund is being used to support the development and demonstration of next-generation clean energy technologies. Funding is fully committed for this program. Projects selected mainly involved carbon capture and storage (Natural Resources Canada 2011b).

The ecoENERGY for Renewable Power Program invested $1.4 billion in renewable electricity projects constructed between April 1, 2007 and March 31, 2011. The goal of the program was to create 14.3 terawatt hours of new electricity from clean and renewable sources (Canada 2010).

In 2007, the federal government announced a four-pronged bioenergy strategy. First, regulations were developed to take effect in December 2010 mandating renewable fuel content in gasoline and diesel of 5% and 2%, respectively. Second, the ecoENERGY for Biofuels Initiative was announced in 2007. This program will provide up to $1.5 billion over nine years to increase renewable fuel production. Third, the federal government created an ecoAGRICULTURE Biofuels Capital Initiative that will allocate $200 million to projects (maximum of $25 million for each project) to help farmers raise capital to construct or expand biofuel production facilities. Fourth, the federal government announced new funding

[1] Municipal governments also develop energy policies but cataloguing them is beyond the scope of this appendix.

for Sustainable Development Technology Canada (SDTC) earmarked for biofuel projects (Canada 2011b).

SDTC is a federally funded nonprofit foundation that seeks to bridge the technology development and demonstration and commercialization funding gaps. Its $590 million SD Tech Fund is for demonstration and development of clean energy technology projects. SDTC entertains a wide variety of projects, including energy exploration, production, transmission and distribution, power generation and energy utilization projects. The SDTC also administers a $500 million NextGen Fund for biofuels development and commercialization. Projects that are "first-of-kind" facilities that produce renewable fuels from Canadian biomass and have had success at the pilot scale are eligible (Sustainable Development Technology Canada 2011).

Companies that invest in renewable sources of energy generation or more efficient sources of energy generation are eligible for an accelerated capital cost allowance (accelerated CCA). Eligible equipment may be written off for tax purposes at 50% on a declining balance basis (Canada 2011c); this is faster than typical depreciation rates of 4 to 20%.

Research and Development

CanmetENERGY is a division of Natural Resources Canada responsible for clean energy science and technology research. The division is over 100 years old and continues to develop and demonstrate technologies to meet energy sector needs. Some areas CanmetENERGY focuses on include oil sands, renewable energy and clean fossil fuels (Natural Resources Canada 2009).

Through its Industrial Research Assistance Program (IRAP), the National Research Council (NRC) provides technical and financial support to small- and medium-sized enterprises (SMEs) for research and development projects (National Research Council 2011). IRAP supports a wide range of projects, including energy sector projects.

In western Canada, the federal Department of Western Economic Diversification (WD) is partnering with the governments of Alberta, British Columbia, Manitoba and Saskatchewan to deliver a total of $200 million in funding under the Western Economic Partnership Agreements (WEPAs). The federal government is contributing $25 million in each province that is being matched by the provinces for a total of $50 million in each province. The program has a broad mandate, but its priorities include research and development and technology commercialization support and increases in value-added production in traditional industries (Western Economic Diversification 2011). Energy industry projects are eligible for funding under WEPAs' broad priorities.

The Canada Revenue Agency (CRA) operates the Scientific Research and Experimental Development (SR&ED) program. It is the single largest federal government support for industrial research and development. Any Canadian-controlled private corporation (CCPC) is eligible for a non-refundable investment tax credit (ITC) of 35% up to the first $3 million of qualified expenditures for SR&ED carried out in Canada, and 20% on any marginal qualified expenditures above $3 million. Any corporation carrying out research that advances the understanding of scientific relations or technologies or addresses scientific or technological uncertainty are eligible, so long as they use qualified personnel and conduct a systematic investigation (Canada Revenue Agency 2009).

Energy Production Policies

Since the mid-1990s, the federal government has allowed accelerated capital cost allowances for oil sands projects. Eligible corporations were able write off 100% of their capital investments. In the face of rapidly rising oil prices, the federal government committed to phasing out this tax break in its 2007 budget. Projects that start claiming the accelerated CCA in 2011 are eligible for a 90% rate. Those that start claiming the accelerated CCA in 2012 are eligible for an 80% rate. In 2013 and 2014, new claimants face rates of 60% and 30% respectively. As of 2015, the rate falls to 0% (Environment Canada et al. 2008). Under other CCA regulations, the oil sands will still be eligible for a 25% CCA rate, as are all conventional oil and natural gas developments (EnviroEconomics Ltd., Sawyer and Steiber 2010).

The Canadian Exploration Expense (CEE) is designed to encourage oil and gas exploration by reducing the taxes paid by certain oil and natural gas corporations (as well as others in the mining sector). Under the CEE, companies can deduct from income tax 100% of the costs incurred to determine information about new oil or natural gas reservoirs. For mining companies, the CEE also includes pre-production development expenses[2] (Department of Finance Canada 2003).

[2] The "Canadian Renewable and Conservation Expense" (CRCE) makes up part of the CEE. The CRCE includes intangible costs (e.g., feasibility studies) associated with renewable energy and energy efficiency projects (Canada Revenue Agency 2010).

The Canadian Development Expense (CDE) is another tax incentive aimed at the oil and natural gas sector and the mining sector. Expenses that do not qualify under CEE, but involve preparing a site for resource extraction are eligible for a 30% tax deduction on a declining balance basis (Department of Finance Canada 2003).

The Canadian Oil and Gas Property Expense (COGPE) is a tax expenditure limited to the oil and natural gas sector. It is designed to reduce the costs of acquiring an oil or gas well, an interest or right to explore or drill for oil or natural gas, or an interest in natural gas or oil production. It can be deducted at a rate of 10% from income tax (Department of Finance Canada 2003).

An additional incentive designed to help junior corporations in their exploration and development activities is the "flow-through share" (FTS). Many of these companies cannot make full use of CEE or CDE. They also tend to have trouble raising capital. FTSs are new issues of common stock that come with a privilege: investors can claim the tax credits earned by the corporation (Canada Revenue Agency 2008). As a result, even if a corporation cannot make full use of its CDE or CEE, it can issue FTSs to get capital in return for "selling" their deductions to investors. Because these shares carry a tax deduction, they are sold at a higher price than regular shares.

Resource-extracting companies can claim a resource allowance under which provincial royalties and mining taxes can be deducted from federal income tax. Initially, 100% of royalties and mining taxes were deductible, but a 25% cap was introduced in the 1970s because the allowance was eating up a growing portion of the federal tax base. As of 2007, royalties and mining taxes became fully deductible again (Department of Finance Canada 2003).

Energy Efficiency and Conservation

In its 2010 budget, the federal government continued the EcoENERGY Retrofit program. Since the program begin in 2007, the government has committed $1.145 billion to the program., homeowners who undertake renovations to make their homes more energy efficient are eligible to receive up to $5,000 to subsidize the renovations (Canada 2011c). The federal government renewed the program, adding an additional $400 million in the 2011-2012 fiscal year.

The federal government is helping businesses assess methods to increase energy efficiency, intensity, use and consumption through the EcoENERGY Efficiency for Industry Program. Businesses are eligible for funding up to 5% of study costs to a maximum of $25,000 (Natural Resources Canada 2010b).

Interprovincial Cooperation

In 2010, as part of the New West Partnership, British Columbia, Alberta and Saskatchewan signed a memorandum of understanding (MOU) on energy policy. Under this non-binding MOU, the provinces will work in collaboration to:

- exchange information on regulatory streamlining and process improvements;
- promote energy technology development and deployment in the energy sector;
- promote energy infrastructure of mutual interest;
- coordinate on strategies for increased market access and market diversification of energy goods;
- continue to work together to pursue a commercial arrangement for the adoption and implementation of the Petroleum Registry within British Columbia; and
- exchange information on energy efficiency and alternative energy and promote responsible energy development and use (British Columbia, Alberta and Saskatchewan 2010).

Several Canadian provinces are participating in the design and implementation of a regional cap and trade system through the Western Climate Initiative (WCI). The cap and trade program's goal is to reduce greenhouse gas emissions by 15% below 2005 levels by 2020. Its first compliance period is supposed to begin in 2012. The program's partners include seven American states in addition to British Columbia, Manitoba, Ontario and Quebec (Western Climate Initiative 2012).

Select Energy Policies in British Columbia

Environmental Stewardship Policies

In 2007, BC adopted the *BC Energy Plan: A Vision for Clean Energy Leadership.* Notably, the plan commits BC to achieving zero greenhouse gas emissions from coal-fired electricity generation. All new electricity projects must have zero net greenhouse gas emissions. Among other policy actions related to environmental stewardship, the plan also committed BC to:

- ensure zero net greenhouse gas emissions from current thermal generation plants by 2016;
- ensure 90% of total electricity generation continues to come from clean or renewable sources;
- acquire 50% of BC Hydro's incremental resource needs through conservation by 2020;
- attain provincial electricity self-sufficiency before 2016;
- create a $25 million Innovative Clean Energy Fund;
- implement energy efficient building standards by 2010; and
- pursue the Bioenergy Strategy to utilize BC's biomass resources more fully (British Columbia Ministry of Energy, Mines, and Petroleum 2007a).

The objective of electricity self-sufficiency was amended in February 2012 because of the additional electricity requirements expected to result from BC's intention to build and operate three liquefied natural gas (LNG) plants by 2020. The updated policy softens the self-sufficiency objective, making it a requirement based on average as opposed to absolute levels.

The Clean Energy Act, which came into effect in 2010, committed BC Hydro (a provincial Crown corporation) to generating at least 93% of electricity from clean or renewable resources (up from the 90% in the 2007 Energy Plan), curbing energy use and encouraging conservation by cutting the expected increase in demand for electricity by at least two-thirds by 2020 and meeting greenhouse gas emissions targets of 33% less than 2007 levels by 2020 (British Columbia 2010).

BC's Greenhouse Gas Reduction Targets Act came into force on January 1, 2008, enshrining the province's emissions reductions targets in law. The legislation sets the emissions target at 33% below 2007 levels by 2020 and at 80% below 2007 levels by 2050. The act also commits BC to having a carbon-neutral public sector starting in 2010. This means that for each calendar year in which the public service generates greenhouse gas emissions, it must purchase offsets to net the emissions to zero (British Columbia 2008).

On July 1, 2008, BC's carbon tax came into effect. The goal of the tax is to reduce greenhouse gas emissions. The tax is charged on fuels sold for use within the province. In 2008, the tax was $10/tonne of greenhouse gas emissions. Since then, the tax has increased by $5/tonne each year. It is currently $25/tonne and will increase to $30/tonne on July 1 2012 (British Columbia Ministry of Finance 2011).

Many municipal governments have committed to carbon neutrality. The province drafted the BC Climate Action Charter in consultation with municipalities. Those municipalities that sign it commit to becoming carbon neutral by 2012. Municipalities can become carbon neutral by reducing their emissions, purchasing carbon offsets or carrying out their own carbon offset projects. As an incentive, the province is promising carbon tax relief for municipalities who commit to that goal and report on their progress (British Columbia Office of the Premier 2008).

Alternative Energy

As directed under the 2007 Energy Plan, BC Hydro developed a Standing Offer Program for small clients wishing to sell power to BC Hydro. The program launched in April 2008. Small projects that use clean or renewable resources or high-efficiency electricity cogeneration are eligible. This program was continued under the 2010 Clean Energy Act.

The Clean Energy Act also permits the establishment of a "feed-in tariff" – a program of renewable tariffs or renewable energy payments designed to encourage the development of renewable generation. In BC, the feed-in tariff program may focus on encouraging the adoption of emerging technologies in power generation (British Columbia Ministry of Energy, Mines and Petroleum 2010, 1-3). Preliminary consultation work has been carried out to support the implementation of this program, although it is not currently ready for implementation.

The First Nations Clean Energy Business Fund was also created under the Clean Energy Act. The fund is a $5 million dollar program that launched in April 2011 and will be used to build Aboriginal community capacity (through feasibility

studies, for example), build equity (in other projects or help start their own clean energy projects) or result in revenue sharing (derived from water rentals, land rents and wind participation rents [British Columbia Ministry of Aboriginal Relations and Reconciliation 2011]).

British Columbia's Bioenergy Strategy was launched in January 2008. The three components of the strategy are:

- provide $25 million in funding for a Bioenergy Network for more investment and innovation in bioenergy technology and projects;
- provide $10 million in funding over three years to advance provincial biodiesel production; and
- issue a two-part Bioenergy Call for Power focused on existing biomass inventory in the forest industry (British Columbia Ministry of Energy, Mines and Petroleum 2007b).

The Bioenergy Strategy is expected to help achieve at least 10 community energy projects by 2020, as well as a 50% share of BC's renewable fuel requirements (British Columbia Ministry of Energy, Mines and Petroleum 2007b, 4).

In line with goals established under the 2007 Energy Plan, BC Hydro implemented its Clean Power Call in 2008. Anticipating a shortfall in electricity availability beginning in 2013, BC Hydro intends to fill the gap by awarding of Electricity Purchase Agreements (EPAs). A request for proposals (RFP) process was used to select a total of 27 projects that would use clean or renewable energy to fill the gap (BC Hydro 2011a).

BC has adopted a Renewable and Low Carbon Fuel Requirements Regulation. As a result, gasoline sold from 2010 onwards must have 5% renewable content (i.e. biofuels) while diesel sold from 2012 onward must have 5% renewable content (British Columbia Ministry of Energy and Mines 2011a).

Research and Development

British Columbia offers a Scientific Research and Experimental Development (SR&ED) tax credit that follows similar eligibility criteria to the federal tax credit (see the Select Federal Energy Policies section above). There are refundable and nonrefundable elements to the tax credit. The refundable credit is the lesser of 10% of qualifying SR&ED expenditures in BC in the taxation year and the expenditure limit defined in the act. (For most eligible businesses, the expenditure limit will be $3 million, capping the refundable tax credit at $300,000.) To be eligible for the refundable portion, the corporation must be a "Canadian-controlled private corporation" (CCPC). If the corporation is a CCPC that has more SR&ED expenditures than its limit or the corporation is not a CCPC, it is eligible for a non-refundable tax credit. The non-refundable tax credit is 10% of SR&ED expenditures, less the refundable tax credit. It can be carried forward 10 years or back 3 years (British Columbia Ministry of Finance 2010).

British Columbia has established a $50 million Natural Resources and Applied Sciences Endowment (NRAS). Researchers working in the areas of natural resources, applied science and engineering are eligible. The fund's goal is to build research and development, advanced training and technology transfer and commercialization capacity in BC in these areas (British Columbia Office of the Premier and British Columbia Ministry of Science and Universities 2011).

Geoscience BC is an industry association that encourages mineral and oil and gas exploration investment in the province. It does so by funding applied geoscience projects. Granted $25 million in 2005, it recently received an additional $12 million for use on energy geoscience projects alone (Geoscience BC 2011).

The BC Renaissance Capital Fund Ltd. (BCRCF) is a Crown corporation dedicated to attracting venture capital investment to the province. BCRCF provides private venture capitalists with financing, subject to certain commitments, which may include: opening BC offices of the venture capital firm; networking and forming strategic alliances with BC venture capital firms; networking with local stakeholders and exploring investment opportunities in the province; and having partners spend a certain number of days per quarter in BC. The BCRF is focusing its efforts on a few sectors, including clean energy technology (BC Renaissance Capital Fund 2011).

The Innovative Clean Energy (ICE) Fund was created in 2007. Since then, 56 projects worth over $390 million have been approved for $72 million in funding. Generally speaking, the ICE Fund supports pre-commercial energy technology or commercial energy technology not currently used in BC (British Columbia Ministry of Energy and Mines 2011b).

Energy Efficiency and Conservation

BC Hydro operates a broad Power Smart program. The program includes a variety of residential, commercial, and industrial subprograms. One such subprogram is an incentive designed to entice developers to build more energy-efficient dwellings. Single-family homes built with an EnerGuide rating of 80 or higher are eligible for up to $2,000 per home. Apartment and condominium buildings, and single-family homes are also eligible for up to $200 per suite or home to subsidize the purchase of Energy Star appliances (BC Hydro 2011b). There are many other options, including subsidizing an energy manager to help businesses reduce their energy use, residential appliance rebates, and a variety of subprograms to help industry minimize its energy use.

The provincial government offers a LiveSmart BC Efficiency Incentive Program. Eligible homeowners (those who have not received previous assistance from LiveSmart or the federal ecoENERGY programs) completing energy efficiency modifications to their home are eligible for grants ranging in size from $20 to $2,500 for meeting certain requirements. There is no cap on the number of incentives for which a homeowner may qualify (British Columbia Ministry of Energy and Mines, BC Hydro and Fortis BC 2011).

The LiveSmart BC Small Business Program also provides incentives for small businesses to pursue energy efficiency. There are four different options under this program. One option is to have business energy advisors analyze a business's energy saving opportunities. There is also a direct install option for a variety of business equipment whereby the installation costs of new equipment are 100% covered (but the cost of the equipment itself are not). Another option is for LiveSmart to provide an extra 10% in funding on top of a BC Hydro Product Incentive Program (a program with incentives for the installation of energy efficient retrofits). The final option is

British Columbia Natural Resource Revenue

Fiscal Year	Natural Gas Royalties (billions)	Crown Land Tenures (billions)	Columbia River Treaty (billions)	Other Energy and Minerals (billions)	Forests (billions)	Other Resources (billions)
2009-2010	$0.406	$0.867	$0.168	$0.421	$0.387	$0.397
2008-2009	$1.314	$0.814	$0.231	$0.479	$0.557	$0.412
2007-2008	$1.132	$0.569	$0.246	$0.367	$1.087	$0.340
2006-2007	$1.207	$0.441	$0.223	$0.456	$1.276	$0.341
2005-2006	$1.921	$0.386	$0.319	$0.392	$1.214	$0.316
2004-2005	$1.439	$0.342	$0.258	$0.256	$1.363	$0.301
2003-2004	$1.23	$0.320	$0.230	$0.199	$1.014	$0.300
2002-2003	$1.056	$0.267	$0.100	$0.202	$1.323	$0.270
2001-2002	$0.836	$0.254	$0.360	$0.173	$1.253	$0.298
2000-2001	$1.249	$0.219	$0.632	$0.207	$1.341	$0.308

Petroleum and Natural Gas

	Natural Gas Royalties (billions)	Permits and Fees (billions)	Petroleum Royalties (billions)	Minerals (billions)	Forests (billions)	Water Resources (billions)
1999-2000	$0.328	$0.248	$0.094	$0.047	$1.392	$0.397
1998-1999	$0.194	$0.106	$0.062	$0.044	$1.093	$0.322
1997-1998	$0.156	$0.214	$0.077	$0.052	$1.364	$0.322
1996-1997	$0.173	$0.206	$0.074	$0.047	$1.408	$0.264
1995-1996	$0.094	$0.168	$0.053	$0.078	$1.348	$0.267

Note: "Crown Land Tenures" include tenure of Crown land for a variety of purposes not limited to natural resource extraction. Source: British Columbia government reports.

to participate in the Champion Program, which encourages businesses to come up with innovative plans to conserve energy in their specific sector with up to $25,000 available for an individual project (British Columbia 2011).

BC's public sector is also pitching on the energy conservation front. The Public Sector Energy Conservation Agreement (PSECA) was designed to help the provincial public service conserve energy and become more energy efficient. Over three years, starting in 2007, 247 projects were funded, resulting in 35,600 tonnes of reduced greenhouse gas emissions (Ministry of Environment 2011).

Energy Production Policies

General

Given the seasonal nature of natural gas and oil drilling, the government of British Columbia provides incentives for producers to drill wells in the summer. One such incentive is the summer royalty program. Any wells drilled after March 31 and before December 1 of any year are eligible to receive a royalty credit equal to 10% of the goods and services costs attributable to the well to a maximum of $100,000 per well. Another such incentive is the infrastructure royalty credit program which provides royalty relief up to 50% of the costs of constructing roads, pipelines or other facilities associated with oil and gas extraction (British Columbia Ministry of Finance 2010).

Oil and natural gas producers can apply for a net profit royalty program. This program is designed to encourage the development of resources that are not near existing infrastructure or are technically demanding (British Columbia Ministry of Energy and Mines 2009).

Oil

There are a variety of formulae used to calculate royalty rates for oil extraction in British Columbia. Some formulae are price and quantity sensitive and some are only quantity sensitive.

- "Old oil" from wells drilled before November 1975 is subject to a royalty rate between 0% and 12% if production is less than 95 m^3/month. If production exceeds 95 m^3/month, then a marginal rate of 40% is applied as well.
- "New oil" from wells drilled between October 1975 and January 2000 faces a royalty rate between 0% and 15% up to 159 m^3/month of production. After 159 m^3/month, a marginal rate of 30% is charged on production.
- Third tier oil, from wells drilled since December 1999, is assessed a minimum royalty of 0% and a maximum royalty of 12% and is determined by both price and quantity. A marginal royalty rate of 24% is applied if production is greater than 159 m^3/month.
- For "heavy oil," the royalty rate is both price- and quantity-sensitive between 20 m3/month and 200 m^3/month. Heavy oil wells producing less than 20 m3/month are royalty-exempt, while those producing more than 200 m^3/month face a marginal royalty rate of 26.4% (Alberta Energy 2011).

A freehold production tax is charged on crude oil that does not have a Crown interest in British Columbia. The rate is dependent on production levels, but does not vary by the type of oil being recovered. When production is less than 159 m^3/month, the tax ranges from 0% to 9.54%. Above that level, the tax starts at about 9.9% and increases with production and is capped effectively at 20% (Alberta Energy 2011).

There are only two royalty-reduction programs exclusively for oil in British Columbia. Oil that is produced from a discovery well (a well that has encountered a previously undiscovered pool) is royalty exempt for the first 36 producing months. Any oil recovered using enhanced oil recovery is classified as third tier oil, regardless of when the oil well was drilled (Alberta Energy 2011).

Natural Gas

Natural gas royalty rates in British Columbia are sensitive only to price and not to quantity.

- "Conservation gas," which is natural gas in solution with oil, is charged at a minimum rate of 8%.
- "Non-conservation gas" is broken down into different types based on when the wells were drilled and acquired.

  More recently drilled and acquired wells are charged less than those that were drilled before 1998.

  Natural gas produced from wells drilled before June 1, 1998 are charged a minimum 15% royalty rate.

  For most wells drilled after June 1, 1998, a royalty formula that produces a minimum royalty rate of 12% and a maximum royalty rate of 27% is used.

  For wells drilled after June 1, 1998 and are completed within five years of rights acquisition, a royalty formula is used that results in a minimum 9% royalty and a maximum 27% royalty (Alberta Energy 2011).

Natural gas royalties in British Columbia are eligible for a cost allowance deduction. There are two types of cost allowances: the producer cost of service allowance (PCOS) and the gas cost allowance (GCA). PCOS allowances cover the cost of transporting the Crown's share of raw natural gas from wellhead to a gas processing plant. The PCOS rate is based on the equipment costs needed to get that natural gas to the processing plant (British Columbia 2009a). The GCA is meant to cover the costs of processing the Crown's share of natural gas and the transport of the Crown's share through pipelines (British Columbia 2009b).

British Columbia has three deep natural gas royalty reduction programs.

- One provides royalty credits that are linked to individual wells and can be applied against their future royalties. Any vertical well of at least 2,500 m or a horizontal well of 2,300 (or 1,900 m if spudded after August 31, 2009) is eligible.
- Similarly, there is a deep well re-entry royalty reduction program. Any deep well (at least 2,300 m) that is re-entered and drilled deeper is eligible for a royalty reduction. Both of these programs base the royalties on the distance drilled.
- The third deep program is for discovery wells. These well are defined as being deeper than 4,000 m and their surface locations are 20 km or more away from any other well. Wells in this program receive the lesser of a three year royalty holiday or 283,000,000 m^3 of royalty free natural gas (Alberta Energy 2011).

British Columbia also targets marginal and ultra-marginal production through royalty programs. If a natural gas well produces only non-conservation gas and over its first 12 months of operation it produces less than 23 m^3 for every metre of well depth, then it is eligible for a reduced royalty rate. The minimum royalty rate remains 9% or 12% depending on the type of well in question. There is also an ultra-marginal royalty program which provides reduce royalty rates for a well that produces less than 17 m^3 or 11 m^3 per metre of well depth, depending on well type. In both marginal and ultra-marginal cases, the royalty savings are determined inversely to well production (Alberta Energy 2011).

Coalbed methane wells in British Columbia receive special considerations. The PCOS allowance for coalbed methane wells can be banked to collect excess PCOS allowances over the years (though these allowances cannot be used against conventional natural gas royalties). The low productivity well cutoff is increased from 5,000 m^3 per day to 17,000 m^3 per day. Finally, a $50,000 royalty credit and a $30,000 production tax credit will apply respectively to completed coalbed methane wells on Crown and freehold land, respectively (Alberta Energy 2011).

British Columbia charges a freehold production tax on natural gas. This tax is price sensitive. For conservation gas, the rate is 5% when the monthly reference price is less than or equal to $50/108 m^3. At price levels beyond $50, the freehold production tax rate increases, up to a maximum of 9%. Similarly, the non-conservation gas tax rate is 9% when the price is less than $50 and peaks at 15% (Alberta Energy 2011).

Coal

British Columbia taxes coal under the Mineral Tax Act. There are two parts to the tax.

- The first is the Net Revenue Tax. This tax is charged as 13% of the producer's profit, though only for producers who have begun to make a reasonable return on their mine. In other words, the tax is not collected on mines that have just started up and as such likely have minimal sales of product and high capital costs.
- The second tax is a Net Current Proceeds Tax. This is charged as 2% of the operating cashflow in cases where production yields a less-than-reasonable profit. So that only one of the two is paid, the Net Current Proceeds Tax is deductible against the Net Revenue Tax (British Columbia Ministry of Finance 2009).

Select Energy Policies in Alberta

Environmental Stewardship Policies

In 2008, the Alberta government announced a Climate Change Strategy to complement legislation passed in 2002 on climate change. The strategy includes measures to reduce annual emissions by 200 megatonnes by 2050 (14% below 2005 levels). Three key themes to achieving this goal are: energy conservation and energy efficiency; the use of carbon capture and storage (CCS); and environmentally-sustainable energy production (Alberta 2008d).

Under the first of these themes, energy efficiency and conservation, the Alberta government has targeted a 24-megatonne reduction of emissions. The government aimed to achieve this target by:

- legislating an Energy Efficiency Act;
- encouraging the use of energy efficient appliances and home improvements through an incentive program;
- putting into action energy efficiency standards in building codes for residences and commercial buildings;
- helping municipalities identify emission reduction strategies including land use planning and sustainable development activities;
- putting into action emission reduction strategies for agriculture and forestry, including CCS and offsets;
- developing procedures for large emitters (over 50,000 tonnes of greenhouse gases [GHG]) to report their emissions;
- ensuring the continued success of the carbon offset market in Alberta;
- greening government operations by introducing energy efficiency standards for government buildings and buying more energy efficient vehicles; and
- creating a team to raise awareness of conservation and energy efficiency (Alberta 2008d).

Under the rubric of CCS, the Alberta government expects to achieve a 139-megatonne reduction in GHG emissions. The strategy calls for the Government of Alberta to support CCS research and demonstration. It also calls for the creation of the Carbon Capture and Storage Development Council (which released its final report in 2009) which would assess and recommend appropriate policy, timelines and regulations to:

- ensure new big industrial facilities are built to capture CO_2;
- ensure current big industrial facilities plan to be capture-ready;
- develop a policy approach and get financial resources to build CCS infrastructure; and
- propose tools and incentives to help Alberta industry lead CCS technology implementation (Alberta 2008d).

Finally, another 37 megatonnes of emissions reductions are to come from the greening of energy production. Alberta plans to:

- utilize the Climate Change and Emissions Management Fund coupled with other government funding to drive innovation, research and development and implementing greener energy production;
- reduce barriers and consider incentives for the adoption to renewable and alternative energy adoption; and
- raise investment in demonstration and deployment of clean energy technologies (Alberta 2008d).

Alberta operates a baseline-credit system for its largest greenhouse gas emitters. Emitters of more than 100,000 tonnes of greenhouse gases are required to report their emissions each year. They are to reduce their emissions to meet a target which depends on the age of the facility. For newer facilities, the target ranges between 2% and 10% per year in emissions intensity (greenhouse gases per unit of output) reductions. For older facilities, the target is 12% per year. If facility owners fail to meet the target, they have three options. They can:

- purchase unused credits from facilities that perform better than their target;
- pay $15/tonne into the Climate Change and Emissions Management Fund; and/or
- buy carbon offsets (Alberta Environment and Water 2012).

In order to receive environmental approval for new coal and oils sands mining projects, mine operators must commit to reclaim disturbed land. Alberta Environment collects a security deposit to ensure that reclamation actually takes place. When the land is reclaimed, the operators get their deposit back. If the land is partially reclaimed, the operators may be entitled to a partial refund. If the land is not reclaimed, the security deposit is used to pay for reclamation (Ministry of Environment 2010).

Alternative Energy

In 2006, Alberta announced a Nine-Point Bioenergy Plan with the goal of encouraging the development of the bioenergy sector in Alberta. Three initiatives worth more than $200 million are part of the plan.

By far the largest of these three initiatives is the Bioenergy Producer Credit Program. The program was set to run from 2007-2011 and have a budget of $209 million. It has been renewed and expanded to the end of March 2016. In its initial phase, the program only covered liquid bioefuels and biogas, but its extended second phase will include biocarbon, commercial wood pellets and biosludge pellets as well as incineration of biomass (Alberta Energy 2011b). Projects that meet all eligibility criteria receive 9 cents per litre for facilities with annual production levels of at least 150 million litres to a maximum of $20 million per year and a $75 million maximum per project over the program's lifespan. Projects with less than 150 million litres production per year are eligible for 14 cents per litre in funding up to a maximum of $15 million per year (Alberta 2007).

The second component of the Bioenergy Plan is the $24 million Biorefining Commercialization and Market Development Program (BCMDP) that was established for the 2007-2008 fiscal year. A project funded under both the BCMDP and the Bioenergy Infrastructure Development Program (BIDP) is eligible for a maximum combined assistance of $5 million. In phase 1 of BCMDP, for which applications were due by March 1, 2009, the Alberta government could reimburse proponents 20% of eligible costs for capital projects or up to 50% of eligible costs on non-capital projects (Alberta 2008a).

Phase 2 of the program, with an application deadline of March 31, 2011, will support similar projects, but the funding will be based on a formula tied to the total project costs. Projects with lower total costs will be funded at a higher ratio (to a maximum of 50%) than projects with greater total costs. The distinction between capital and non-capital costs was also removed (Alberta 2008b).

The final component of the Bioenergy Plan is the $6 million Bioenergy Infrastructure Development Program (BIDP) which is strictly for projects that result in the development or expansion of the distribution infrastructure of biofuel and energy transmission. Eligible projects include those that develop industrial infrastructure (e.g., cogeneration units, biofuel storage) or environmental infrastructure (e.g., noise suppression systems, site landscaping). BIDP projects are capped at $5 million in funding, including funding under BCMDP (Alberta 2008c).

Additionally, the Alberta government has implemented a Renewable Fuels Standard (RFS). The RFS requires all vehicle fuel sold in Alberta to have a certain level of renewable fuel content: 2% in the case of diesel fuels and 5% renewable alcohol content in the case of gasoline (Alberta 2011b). The renewable fuel standard came into effect on April 1 2011.

Research and Development

Alberta Innovates is an organization that funds research and development in Alberta with long-term endowment funds. It is a nexus for academia, government and businesses. Alberta Innovates has an Energy and Environment Solutions section with a wide variety of energy and environmental research programs. These programs include:

- AACI (formerly Aostra Arc Core Industry) develops technology needed in field application;
- the Alberta Ingenuity Centre for In Situ Energy develops more efficient, less costly and more environmentally sustainable technology for in situ oil sands recovery and upgrading;
- the Canadian Centre for Clean Coal/Carbon and Mineral Processing Technology researches clean coal, mineral processing and carbon capture and storage technology;
- the Canadian Clean Power Coalition researches clean electricity generation from coal by reducing emissions;
- the National Centre for Upgrading Technology researches bitumen and heavy oil upgrading technologies that use less energy, produce fewer greenhouse gas emissions and make fuels cleaner;
- the Innovative Energy Technologies Program supports innovation in conventional oil, oil sands and natural gas production through temporary royalty reductions (Alberta Innovates 2011a).

Alberta Innovates also offers an Innovation Vouchers program under its Technology Futures division. Small start-up companies are eligible to receive a $15,000 voucher or a $50,000 voucher or both.

- The $15,000 voucher can be used for an opportunity assessment (a professional assessment of the technology, market feasibility, etc.), other specialized business development services or mentoring, small scale prototype development or intellectual property services.
- The $50,000 voucher can be used for larger-scale prototype development and other development and demonstration, protection of intellectual property, business plan development or market studies or specialized services to obtain venture capital financing. Alberta Innovates accepts applications on a quarterly basis and the vouchers are to be used to pay for services, not to fund work within the company (Alberta Innovates 2011b).

Alberta also offers a tax credit to encourage research and development. The Alberta Scientific Research and Experimental Development Tax Credit is designed to encourage the development of new or improved technology and processes. The refundable tax credit is valued at 10% of a company's eligible expenditures up to $4 million, and is capped at $400,000 (Alberta Advanced Education and Technology 2011).

Energy Efficiency and Conservation

The Alberta provincial government offers various incentives for energy efficiency and conservation improvements through the nonprofit organization Climate Change Central (now called C3). One recently offered program is Trucks of Tomorrow, which provides up to $30,000 in rebates for companies with commercial fleet vehicles to adopt aerodynamic and fuel-efficient technologies. There is also a rebate program of up to $300 for replacement of domestic hot water systems with high efficiency water heaters. Albertans can also save up to $600 on their new furnace or boiler if it meets the efficiency requirements. The Alberta government is also subsidizing the purchase of gasoline-electric hybrid taxis to the tune of $3,000 (C3 2011).

Another program operated under C3 was a rebate on new homes that met certain energy efficiency standards. The program, which was available until March 31 2012, gave the following rebates:

- $1,500 for new homes receiving an EnerGuide rating of 80 or 81;
- $3,000 for new homes receiving a rating of 82 to 85; and
- $10,000 for homes with an EnerGuide rating of 86 or higher.

Energy Production Policies

On May 27, 2010, the Alberta government announced the current royalty regime for natural gas and oil extraction.

General

Any new oil, gas, or crude bitumen well is eligible for the New Well Royalty Rate program if production commenced on or after April 2009, or if production recommenced after April 1, 2011 after at least 36 months of dormancy. Qualifying wells are to be charged a maximum 5% royalty rate for 12 production months or the oil equivalent of 7,949 m^3 (14,158 $e3m^3$ [thousand cubic metres]) of gas (Alberta Energy 2010).

In January 2011, the Adjusted Royalty Framework came into effect in Alberta. This new framework scaled back the proposed royalty hike introduced in 2007 under the New Royalty Framework. The current royalty rates are discussed further below.

To help companies adjust to the new royalty regime, the Alberta government has introduced a transitional royalty rate applicable to oil and natural gas wells spudded in 2009 or 2010. The transitional rates expire after December 31, 2013 (EnviroEconomics Inc., Sawyer and Stiebert 2010).

The Alberta government also provided temporary stimulus for oil and natural gas wells that expired on April 1, 2011. The Drilling Royalty Credit program awarded up to $200 per unique drilled meter dependant on each well's Crown interest. This credit could be deducted from royalties to be paid or could be sold to other companies (Alberta Energy 2011c).

In some cases, corporations are allowed to deduct royalties paid from their provincial income tax. They can only deduct royalties not previously deducted from federal income taxes (EnviroEconomics Inc., Sawyer and Stiebert 2010).

The Innovative Energy Technologies Program (IETP) supports projects that are experimenting with techniques to enhance incremental production from conventional oil, in situ oil sands and natural gas developments. Up to 30% of the eligible costs may be deducted from royalties (Alberta Energy 2011d).

The Incremental Ethane Extraction Program (IEEP) is designed to increase value-added production in Alberta. Royalty credits encourage incremental ethane production to be used in Alberta's petrochemical industry. The incremental ethane can come from natural gas or as off gas from bitumen upgrading or refining. Companies must apply to the program and be approved to receive the royalty credits (Alberta 2011c).

Alberta charges freehold taxes on natural gas, condensate and oil and gas in solution. The formulae are all very similar: they are price- and quantity-sensitive and take into account low productivity wells. Oil and gas owners are exempt up to $1,600 of the tax (Alberta Energy 2011).

Oil

Conventional oil royalties are based on a price component and a quantity component. The minimum rate for conventional oil is 0% and the maximum is 40% (Alberta 2010). Royalties can be paid in cash or in-kind. However, specific wells may be eligible for royalty reductions/credits or a capped royalty rate.

New horizontal oil wells drilled on or after May 1, 2010 are eligible for a reduced royalty rate. These wells are charged a maximum of 5%, with volume and production limits based on the depth of the well (Alberta 2010).

In 2009, the Deep Oil Exploratory Well program was implemented. Deep oil wells exceeding a true vertical depth of 2,000 m are eligible for up to $1 million in royalty relief over a 12 month production period if they are drilled on or after January 1, 2009 (Alberta Energy 2009a).

Alberta Natural Resource Revenue

Provincial Government Fiscal Year (bill.)	Natural Gas and By-Products Royalty (bill.)	Conventional Crude Oil Royalties (bill.)	Synthetic Crude Oil (SCO) and Bitumen (Oil Sands) Royalty (bill.)	Coal Royalty (bill.)	Free-hold Mineral Rights Tax (bill.)	Bonuses from the Sale of Crown Leases (bill.)
2009–2010	$1.525	$1.848	$3.160	$0.031	$0.124	$1.165
2008–2009	$5.834	$1.800	$2.973	$0.036	$0.261	$1.112
2007-2008	$5.199	$1.655	$2.913	$0.014	$0.247	$1.128
2006-2007	$5.988	$1.400	$2.411	$0.013	$0.317	$2.463
2005-2006	$8.388	$1.463	$0.950	$0.011	$0.334	$3.490
2004-2005	$6.439	$1.273	$0.718	$0.011	$0.306	$1.252
2003-2004	$5.450	$0.981	$0.197	$0.009	$0.288	$0.967
2002-2003	$5.125	$1.177	$0.183	$0.010	$0.202	$0.565
2001-2002	$4.030	$0.987	$0.185	$0.017	$0.319	$0.970
2000-2001	$7.200	$1.500	$0.712	$0.012	$0.256	$1.159
1999-2000	$2.441	$1.103	$0.426	$0.015	$0.134	$0.743
1998-1999	$1.467	$0.450	$0.059	$0.017	$0.112	$0.464
1997-1998	$1.660	$0.903	$0.192	$0.018	$0.131	$1.071
1996-1997	$1.299	$1.386	$0.512	$0.018	$0.117	$0.927
1995-1996	$1.003	$1.053	$0.312	$0.022	$0.101	$0.576
1994-1995	$1.257	$1.099	$0.209	$0.014	$0.102	$0.978

Note: Does not include Alberta Royalty Tax Credit or Drilling Stimulus Initiatives. Source: Alberta government reports.

The Alberta government also has several royalty relief programs for enhanced oil recovery (EOR) and storage of carbon dioxide in geological formations. Using conventional drilling and extraction techniques will only return a fraction of the oil in the reserve. Injecting hydrocarbons or gases (like carbon dioxide and nitrogen) can increase recovery of oil from reservoirs. Storing carbon dioxide in deep saline formations underground could be a safe way to store greenhouse gases. Such techniques are more expensive than their conventional counterparts, and so the provincial government reduces the royalty rate on the incremental production that results from EOR operations (Alberta Energy 2005).

One of the older royalty reduction schemes still in effect is for experimental petroleum recovery projects. Established in 1979, this program caps Crown royalty rates at 5% of production. This is designed to encourage new ways of extracting petroleum products. To qualify, any experimental extraction scheme must have received approval from the Energy Resources Conservation Board (ERCB). The time period for the royalty relief is negotiated for each eligible project (Alberta 2003).

In the early 1990s, the reactivated well royalty exemption program was implemented. The incentive is used to encourage producers to reactivate wells that have been shut-in for 12 to 24 months. The reactivated well must not be used to access a different oil deposit. A royalty holiday is provided until the reactivated well extracts the oil equivalent of $150,000 worth of royalties (EnviroEocnomics Inc., Sawyer and Stiebert 2010).

Conventional oil wells may also take advantage of the Otherwise Flared Solution Gas Royalty Waiver Program (OFSG). For oil wells with gas in solution that would otherwise be flared, the OFSG provides an incentive to conserve the solution gas instead of flaring it by reducing the royalty that would be paid on the natural gas (Alberta Energy 2011).

Royalties on oil extracted from Alberta's oil sands are calculated differently. An important factor in determining oil sands royalties on a project is whether the project has "reached payout." When the cumulative revenue of the project exceeds its cumulative costs, a project is said to have reached payout. Before it reaches payout, the project pays royalties of 1% of the its gross revenue. After it reaches payout, the project pays 25% of its net revenue or 1% of its gross revenue, whichever is greater (Alberta Energy 2006).

Oil sands producers are given the option of paying their royalties in-kind through the Bitumen Royalty-in-Kind program (BRIK). The goal of the program is to allow the province to get a reliable feedstock of bitumen to promote the growth of value-added processes in Alberta (upgrading and refining the bitumen). The volume delivered is based on the cash royalty that would have been charged to the oil extractor. One project is currently being built to upgrade and refine bitumen from this program. There is also a carbon capture and storage project associated with this new refinery (Alberta Energy 2009b; Alberta 2011a).

Natural Gas

Natural gas royalties are determined on the basis of a price component and a quantity component. The minimum rate for natural gas is 5% while the maximum is 36%. The province also charges royalties on natural gas liquids (propane, butane, pentanes-plus) at 30% or 40% (Alberta Energy 2011).

New coalbed methane wells are subject to a reduced royalty rate. Wells that extract solely from areas defined by the Energy Resources Conservation Board as coal and start producing on or after May 1, 2010 are eligible. The maximum royalty rate is 5% until production exceeds 750 million cubic feet or 36 months pass (Alberta 2010).

Any shale gas wells that began producing on or after May 1, 2010 are eligible for a reduced royalty rate. The maximum royalty that can be charged is 5% for 36 months. There is no cap on production volume (Alberta 2010).

Horizontal gas wells that are operational on or after May 1, 2010 are also eligible for a reduced royalty rate. A maximum rate of 5% will be applied for 18 months or until a volume of 500 million cubic feet is reached (Alberta 2010).

In 2008, the Natural Gas Deep Drilling Program was enacted. This program was modified and made permanent with other royalty changes made in May 2010. Wells that have a "true vertical depth" of 2,000 m or greater are eligible for up to $8 million or $10 million in royalty credits (Alberta Energy 2008), depending on whether the well is developmental or exploratory (Alberta 2010).

There are two different natural gas cost allowances for royalty clients who own gathering, compressing and processing facilities and one cost allowance for royalty clients who pay for those services. The royalty clients are allowed to deduct some of these costs from their royalty payable, however, the allowances are non-refundable and excess allowances cannot be carried forward (Alberta Energy 2011).

Coal

Royalties on coal in Alberta depend on where the coal is mined. Plains coal is charged a $0.55/tonne royalty. Coal from the mountains and foothills is charged 1% of mine mouth revenue before payout. After payout, 1% of mine mouth revenue plus 3% of net revenue is charged (Alberta Energy 2011a).

Select Energy Policies in Saskatchewan

Environmental Stewardship

An act to manage greenhouse gas emissions has received Royal Assent in Saskatchewan:

- The act authorizes the provincial Cabinet to draft and implement an emission baseline and credit scheme.
- Additionally, the act establishes the Saskatchewan Technology Fund. This fund will manage carbon compliance payments from regulated emitters and uses the funding to help the emitters fight climate change through the development of carbon capture and storage technologies, energy conservation efforts, or the development of low emitting technologies and processes.
- The legislation establishes other nonprofit corporations to further similar ends, including the Saskatchewan Climate Change Foundation, which will undertake and support research on technology and public education and awareness of climate change.
- The Saskatchewan Climate Research and Development Corporation will provide financial assistance to those doing research on climate change and adaption.
- Finally, the Environment Corporation will provide financial assistance for carbon capture and storage, energy conservation, low-emitting technologies, adaption to climate change and education and public awareness (Saskatchewan 2010).

The Saskatchewan Research Council is working to reclaim and remediate abandoned northern uranium mines. The Cleanup of Abandoned Northern Sites (CLEANS) project is assessing and reclaiming over 36 sites in northern Saskatchewan, mostly near Uranium City. Many of these sites were abandoned in the middle of the twentieth century without remediation. The majority of project activities will occur before 2015 (Saskatchewan Research Council 2011c).

The Go Green Fund is a fund that may be used to fulfill a variety of objectives. The idea is to demonstrate innovative projects in Saskatchewan with large environmental benefits. These projects would reduce or avoid greenhouse gas emissions, conserve water supplies, maintain or restore water quality, conserve biodiversity, reduce waste or raise awareness about addressing environmental issues (Saskatchewan Ministry of Environment 2011). Though not explicitly authorized as a category, alternative energy projects may be eligible for funding.

Alternative Energy

SaskPower is the Crown corporation responsible for much of the province's electricity supply. It offers three different programs to encourage general renewable energy production.

- The Net Metering Program allows consumers to store their excess energy generated from renewable sources in the power grid for later use in the year. Alternatively, users of the net metering program can draw down extra power from the grid when they use more than they produce for themselves (SaskPower 2011a).
- The Small Power Producers Program gives energy producers the opportunity to sell all of the power produced (or just the surplus power) to SaskPower, up to 100kW (SaskPower 2011b). The Green Options Program, which takes applicants on a yearly basis, is designed to allow renewable energy producers to sell their power to SaskPower. Applicants are eligible for the program if they can generate between 100kW and 10MW (SaskPower 2011c).
- SaskPower also encourages the installation of geothermal heating systems for business and farm customers. Eligible businesses and farmers are entitled to a 15% rebate on the installation of a geothermal heating system in a new or retrofitted building to a maximum of $100,000 (SaskPower 2011d). SaskPower also grants loans

for geothermal or renewable power in new or retrofitted houses. Loans range from $1,000 to $50,000 and interest rates are subsidized by 3.5% (SaskPower 2011e).

The Saskatchewan government also supports the biofuels industry. An ethanol fuel standard was implemented in November 2005. Currently, ethanol must make up 7.5% of the provincial pool volume of gasoline. There is also an ethanol grant program, which provides a $0.15/litre subsidy to eligible distributors who blend Saskatchewan-produced ethanol within the province for sale in the province. In the 2011 budget, the government announced a new biodiesel grant program of $0.13/litre to accompany a biodiesel mandate of 2% (Enterprise Saskatchewan 2010; Saskatchewan 2011d).

Research and Development

Saskatchewan offers a Research and Development tax credit of 15% of qualifying expenditures. All corporations, regardless of ownership, are eligible for the credit as long as the company is registered in Saskatchewan and the research and development expenses are incurred in Saskatchewan. The tax credit is refundable and there are no expenditures, income or capital limits on the provincial tax credit (Enterprise Saskatchewan 2009).

The Saskatchewan Research Council (SRC) does research and development work on enhanced oil recovery techniques and technology. Its goals are to minimize input costs while improving recovery factors and extending the life of pool production (Saskatchewan Research Council 2011a).

The Petroleum Technology Research Centre (PTRC) is a nonprofit organization dedicated to petroleum and natural gas research. It was founded in 1998 by Natural Resources Canada, SRC, Saskatchewan Industry and Resources and the University of Regina. PTRC projects include operating the Weyburn-Midale carbon capture and storage project, managing the JIVE project (an avoided carbon dioxide emissions project), managing Aquistore (a saline carbon capture and storage project) and improving enhanced oil recovery technologies (Petroleum Technology Research Centre 2012).

Energy Efficiency and Conservation

The Saskatchewan government will rebate any provincial sales tax (PST) collected on energy-efficient household appliances (refrigerators, freezers, dishwashers and clothes washers only). The household appliances need to be Energy Star qualified in order to be eligible (Saskatchewan Finance 2011b). On Energy Star furnaces, boilers and other natural gas appliances, SaskEnergy offers concessional loans. The loans can be for up to $15,000 and are charged prime plus 2% interest (SaskPower 2011e).

Homeowners wishing to upgrade their homes to be more energy efficient are eligible to participate in the Saskatchewan EnerGuide for Houses (SEGH) program. SEGH offers grants for individual upgrades ranging from $30 to $3,500. Homeowners completing multiple upgrades are eligible for grants up to $5,000 (Saskatchewan 2011a).

The provincial government also offers an Energy Efficient Rebate for New Homes program. Homes must meet certain qualifications (e.g., Energy Star qualified or an EnerGuide rating of 80 or more). Depending on the requirements met, the rebate could be as much as $5,900. The minimum rebate is $1,000 (SaskEnergy 2011a).

SaskEnergy and SaskPower also offer commercial programs to improve energy efficiency and conservation. The Commercial HVAC Program provides businesses with an incentive to install higher efficiency natural gas furnaces, boilers and rooftop units. Incentives begin at $300 and vary based on a couple of different factors (SaskEnergy 2011b).

SaskPower offers a unique Demand Response Program. SaskPower will pay commercial customers who can reduce their power consumption on request during peak hours. There are two different incentives, mostly differentiated by the notification type and payment. Program Offer 1 only provides the customer with 12 minutes of notice, but customers are eligible for a $52,000/MW-year payment if they can reduce their consumption. Program Offer 2 provides the customer with 2 hours of notice, but the customer is paid a combination of a $20,000/MW-year fixed payment and a $150/MWh curtailed variable payment (SaskPower 2011f).

Saskatchewan Research Council accepted applications for its Municipal Energy Conservation Program until March 31, 2011. This program is designed to help municipalities become more energy efficient, thereby reducing costs and greenhouse gas emissions. Projects that installed energy efficient lighting or heating, implemented demand management strategies at rinks or implemented solar heating were eligible for funding (Saskatchewan Research Council 2011b).

The province, through the Saskatchewan Government Insurance (SGI) Crown corporation, is subsidizing insurance costs for owners of green vehicles. Launched in 2008, the program rewards owners of hybrid vehicles and vehicles that meet Transport Canada's ecoAUTO thresholds for fuel efficiency that are 2006 model year or newer. The rebate is equivalent to 20% of insurance costs and averaged $210 per qualifying customer in the 2010 calendar year (Saskatchewan Government Insurance 2011).

Energy Production Policies

General

The province provides financial backing to research aimed at reducing upstream greenhouse gas emissions. Most of Saskatchewan oil industry's greenhouse gas emissions come from methane emissions, making its emissions profile unique in Canada and indicating the potential necessity of a "made in Saskatchewan" solution. The government hopes that its Oil and Gas Industry Upstream Emission Reduction Initiative will result in techniques that reduce these greenhouse gas emissions. Every year, the government plans on contributing $300,000 to support one to two large projects and $100,000 on smaller projects (Saskatchewan 2011b).

The Saskatchewan Petroleum Research Incentive (SPRI) program is designed to further pilot, research, development and demonstration projects along the complete oil and natural gas value added chain. Eligible projects must

Saskatchewan Natural Resource Revenue

Fiscal Year	Crude Oil Royalty/ Tax Revenue	Crude Oil and Natural Gas Land Sale Revenue	Natural Gas Royalty/ Tax Revenue	Coal Royalty/ Tax Revenue	Other Revenue
2009–2010	$1.162	$0.151	$0.039	Not Available	$0.027
2008–2009	$1.584	$0.928	$0.126	Not Available	$0.033
2007-2008	$1.219	$0.419	$0.134	Not Available	$0.028
2006-2007	$1.120	$0.169	$0.165	Not Available	$0.030
2005-2006	$0.952	$0.141	$0.269	Not Available	$0.032
2004-2005	$0.784	$0.093	$0.212	Not Available	$0.030
2003-2004	$0.590	$0.159	$0.211	Not Available	$0.025
2002-2003	$0.728	$0.110	$0.153	Not Available	$0.025
2001-2002	$0.478	$0.054	$0.129	Not Available	$0.024
2000-2001	$0.713	$0.056	$0.239	Not Available	$0.031
1999-2000	$0.566	$0.048	$0.092	Not Available	$0.026
1998-1999	$0.234	$0.049	$0.066	Not Available	$0.022
1997-1998	$0.354	$0.109	$0.044	$0.017	$0.025
1996-1997	$0.525	$0.141	$0.053	$0.015	$0.025
1995-1996	$0.347	$0.068	$0.041	$0.015	$0.033
1994-1995	$0.306	$0.202	$0.061	$0.016	$0.020

Note: Saskatchewan government reports.

apply for the SPRI incentive. Research that involves the Petroleum Technology Research Centre (PRTC) is eligible for a 50% credit against royalties, to a maximum of $1 million. Additionally, 30% of any remaining PRTC-related costs and all other eligible research costs will be credited against royalties to a limit of $3 million per project. There are several eligibility conditions, including the requirement that the project be carried out in Saskatchewan and that most of the information on the project (except for information on patentable technology) will be made publicly available (Saskatchewan Ministry of Energy and Resources 2011).

Although Saskatchewan eliminated its capital tax for most corporations in July 2008, there remains a form of capital tax on corporations in certain sectors, including companies that sell oil, coal, natural gas, potash and uranium. These face a special Resource Surcharge form of capital tax. For oil and natural gas wells drilled prior to October 1, 2002, and all potash, coal and uranium sold, the Resource Surcharge is 3%. For oil and natural gas wells drilled after September 30, 2002, corporations pay a surcharge equal to 1.7% of resource sales (Saskatchewan Finance 2011a). A Saskatchewan Resource Credit, explained elsewhere in this report, partially offsets this Resource Surcharge.

Oil, natural gas and mining exploration and development expenses may be deducted from corporate income tax. If the corporation in question pays capital tax, the corporation may also use it to reduce its paid-up capital total (Saskatchewan Finance 2003a).

Corporations that are involved in mineral exploration (including energy resources) are eligible for a fuel tax rebate in Saskatchewan. As long as the fuel is used in machinery or equipment directly involved in mineral exploration, the corporation is eligible for a rebate of the fuel tax paid to purchase the fuel (Saskatchewan Finance 2003b).

Some equipment purchases in the oil and gas sector are eligible for a provincial sales tax rebate. Purchases made to support exploration, development, testing and servicing in the oil, gas and potash industries are eligible for rebates (Saskatchewan Finance 2005).

Oil

Conventional oil that is extracted from lands with a Crown interest is subject to royalties due to Saskatchewan. Conventional oil is divided into different categories and subcategories on the basis of geography, when the well was drilled, and other factors. Depending on the type of conventional oil, the minimum royalty rates are 5%, 10%, 12.5%, 15% or 20%. This minimum rate is used when the actual price of the particular type of oil is at or below a base oil price of $50/m^3 or $100/m^3, depending on what kind of conventional oil it is (Ministry of Energy and Resources 2010a). When the average price of oil for a given type of oil is above that base level, a marginal royalty rate is applied to the difference between the average price and the reference price. These marginal rates are 25%, 30%, 35%, and 45%, based on the type of conventional oil produced (Saskatchewan Ministry of Energy and Resources 2010a).

Most conventional oil is eligible for the Saskatchewan Resource Credit which reduces the royalty rate by 1% for most types of oil. The credit is set at 2.5% for conventional oil produced from wells drilled between February 9, 1998 and before October 1, 2002. Incremental oil produced from waterfloods (an enhanced recovery technique involving water injection) implemented between Febraury 9, 1998 and October 1, 2002 is also eligible for the 2.5% credit (Saskatchewan Ministry of Energy and Resources 2010a).

In addition to charging a royalty rate on conventional oil extracted from lands with a Crown interest, Saskatchewan also levies a tax on freehold production. This tax is based on the royalty rate regularly determined for the type of oil less a production tax factor (PTF) dependent upon the type of conventional oil. The PTF is set at 6.9, 10.0 and 12.5 depending on the type of oil. The minimum freehold tax rate is zero. Freehold extractors are also eligible for the Saskatchewan Resource Credit of 1% or 2.5% (Saskatchewan Ministry of Energy and Resources 2010a).

Certain vertical oil wells are eligible for royalty rate and freehold tax reductions on a set volume. A deep development well drilled on or after October 1, 2002 to a depth of at least 1,700 m will only pay a 2.5% maximum royalty on up to 8,000 m^3 of oil. Exploratory vertical oil wells qualify for a maximum 2.5% royalty on the first 4,000 m^3 of oil (if it is a deep exploratory well, the volume incentive increases to 16,000 m3). On all three of these types of wells, the freehold production tax is 0% (Saskatchewan Ministry of Energy and Resources 2010c).

Specific horizontal oil wells are also eligible for a royalty rate reduction on a set volume. Non-deep horizontal oil wells drilled on or after October 1, 2002 are eligible to be charged

at a maximum 2.5% royalty rate for first 6,000 m^3. A deep horizontal oil well has the same maximum 2.5% royalty rate on up to 16,000 m^3 of oil. Horizontal wells accessing freehold resources face a 0% tax rate (Saskatchewan Ministry of Energy and Resources 2010d).

Wells that use Enhanced Oil Recovery (EOR) methods are eligible for a reduced royalty rate to a minimum of 0%. The rate varies depending on whether or not the investment has reached the "payout" phase, among other factors (Saskatchewan Ministry of Energy and Resources 2010e). Additionally, projects that use "waterfloods" to enhance incremental oil production are eligible for "fourth tier oil" royalty rates or freehold tax rates (Saskatchewan Ministry of Energy and Resources 2010e).

Products for use in EOR projects benefit from an EOR tax exemption. As long as the goods in question are acquired for use in an EOR project (specifically, injected directly into the formation to enhance recovery of oil and not for maintenance purposes), they are exempt from the 5% provincial sales tax and fuel tax. These substances include: natural gas, hydrogen chloride, liquid nitrogen, potassium chloride, liquid oxygen, carbon dioxide, propane and butane (Saskatchewan Finance 2006).

In addition to the royalty breaks given to EOR projects, Saskatchewan is also funding carbon capture and storage (CCS) more directly. The provincial government's Carbon Dioxide Enhanced Oil Recovery and Storage Initiative, inaugurated in 2009, will provide $7.2 million to various EOR and CCS projects, including a proposed "clean coal" electricity plant (Saskatchewan Ministry of Energy and Resources 2009).

Saskatchewan has a special tax that applies to "recovered crude oil." This oil is usually stored in recovery facilities and was not accounted for in regular royalty payments. When the crude oil is sold from this recovery facility, its tax is calculated. The rate can vary from 0% to 10%. The amount payable is influenced by allowable transportation expenses from the recovery facility. The higher the allowable transportation expenses, the lower the tax on recovered crude oil (Saskatchewan Ministry of Energy and Resources 2010g).

Saskatchewan is also trying to encourage producers to continue extraction from wells with a high water-cut. When oil is extracted, water often comes out of the reservoir with it. The water-cut is the ratio of water to total fluid (water plus oil) extracted from a well. Wells with high water-cut measurements may be unprofitable. For eligible wells (mostly wells that have a water-cut of 95% or more), they receive "third tier oil" royalty rates and a Saskatchewan Resource Credit of 2.5% (Saskatchewan Ministry of Energy and Resources 2010e).

Saskatchewan also provides incentives to reactivate certain wells. Oil wells that were shut-in or suspended for all of 1993 are eligible for a maximum royalty rate of 4% for 5 years after reactivation (Alberta Energy 2011).

Natural Gas

Natural gas from Crown or freehold land is also subject to royalties. Associated gas (which is extracted at oil wells) and non-associated gas are treated differently, as are wells that were drilled at different times. For most types of natural gas extraction from a well, there is a minimum quantity threshold that needs to be reached before the royalty applies. The royalty also depends on price. When the average price for a given type of natural gas is at or below the base prices of $50/1,000 m^3 or $35/1,000 m^3, the base royalty rates of 5%, 15%, or 20% apply. If the average price exceeds the base price, a royalty rate of 30%, 35%, or 45% applies (Saskatchewan Ministry of Energy and Resources 2010b).

Similar to conventional oil, some non-associated natural gas is eligible for the Saskatchewan Resource Credit (SRC). Depending on the type of gas, a 1% or a 2.5% reduction is possible (Saskatchewan Ministry of Energy and Resources 2010b).

Natural gas producers are permitted a fixed cost allowance of $10/thousand cubic metres. This allowance can be deducted from assessed royalties and is designed to recognize the costs of gathering and compressing the gas (Alberta Energy 2011).

Taxes are also charged on freehold production, although again the tax rate is lower than the royalty rate and may even be zero in some cases. The tax rate is the royalty rate (including the SRC if it is applicable) less the PTF, which is 6.9%, 10% or 12.5% depending on the type of gas (Saskatchewan Ministry of Energy and Resources 2010b).

Exploratory and horizontal natural gas wells are eligible for a reduced royalty rate. However, horizontal wells must be drilled between June 1, 2010 and April 1 2013. These wells on Crown mineral rights are charged a maximum 2.5% royalty

rate for the first 25 million cubic metres of volume. Freehold wells are not charged any tax on production (Saskatchewan Ministry of Energy and Resources 2010f; Saskatchewan Ministry of Energy and Resources 2010g).

Coal

Saskatchewan charges royalties and freehold taxes on coal production. Royalties are charged at 15% of the mine mouth value of the coal produced, while freehold taxes are charged at 7% of the mine mouth value of the coal produced. The mine mouth value is determined based on a fair market value, determined as the average price on coal sold at arm's length during the reporting period from a given mine. Coal producers are eligible for the Saskatchewan Resource Credit of 1% of gross value to partially offset the Corporation Capital Tax Surcharge (Saskatchewan 2011c).

Uranium

Saskatchewan charges royalties on uranium extraction from Crown land. Royalty rates are charged on a corporate basis and are based on the kind of mines that produce the uranium and the price, indexed to inflation, paid for uranium. Uranium sold from a pilot facility or that has been previously processed or that is sold for less than $30/kg only pays the basic royalty rate of 5%. The Saskatchewan Resource Credit of 1% is applied against this royalty rate to generate a net Crown royalty of 4%. For revenues greater than $30/kg, but not greater than $45/kg and the uranium is not from a test mine or previously processed, a 6% royalty is charged. For revenues greater than $45/kg but not greater than $60/kg, a 10% royalty is charged. For revenues greater than $60/kg, a 15% royalty rate is charged (Saskatchewan Ministry of Energy and Resources 2009).

Select Energy Policies in Manitoba

Environmental Stewardship

The Manitoba provincial government has adopted a green building policy for provincially funded projects. This policy would see almost all provincially funded building projects undertaken with a view to being greener than traditional practices. Compliance with this policy became mandatory as of April 1, 2007.

- The first policy criterion is that the projects incorporate an integrated design process (IDP). An IDP brings together a wide range of direct stakeholders to design the building.
- Second, buildings must be built to Silver Leadership in Energy and Environmental Design (LEED) certification. LEED is a rating system used to evaluate the environmental friendliness of a building.
- Third, all buildings constructed or renovated must meet minimum energy efficiency standards. This means that new buildings must have 33% less projected energy use and renovated buildings must have 24% less projected energy use than the reference buildings.
- Fourth, buildings should be supplied with low- or zero-carbon renewable energy. Given Manitoba's green electricity system based on hydro power, electricity from the grid is considered low-carbon. However, the policy advises project proponents to refrain from using conventional electric resistance heating to avoid contributing to increased peak loads.
- Additionally, buildings may use carbon-based fuel sources if it can be demonstrated that they will be less costly over the lifecycle of the building. The energy source must also be flexible to be able to be used with different alternative energy sources in the future (Manitoba Green Building Policy Interdepartmental Working Group 2008).

Manitoba has also revised the commercial building code. For new homes built after December 1 2010, new standards will apply. It is expected that these changes will reduce greenhouse gas emissions significantly and reduce energy and water consumption. These changes include:

- minimum energy efficiency requirements for windows;
- no pilot light gas fireplaces;
- R50 level attic insulation;
- 94% minimum fuel efficiency rating for furnaces;
- mid-range efficiency heat-recovery ventilators;
- reduced maximum-flow rates for toilets and showerheads;
- designs to reuse grey water around the home; and
- energy-modeling software that will allow builders to model differences from the code requirements (Manitoba 2010).

The provincial government is offering funding through its Sustainable Development Innovations Fund (SDIF). Eligible projects must develop, implement or promote sustainable

development or environmental innovation. Eligibility rests on whether or not a project advances one of six objectives. These objectives include supporting sustainable development and environmental innovation, enhancing new research and demonstration not currently dealt with by existing programs, showcasing new techniques and approaches to conserve resources and developing and diversifying the Manitoban economy. Energy projects, particularly ones relating to energy efficiency and alternative energies, may be eligible for funding through this program (Manitoba Conservation 2012).

Manitoba has committed in legislation to reducing its carbon footprint. The 2008 Climate Change and Emissions Reductions Act pledges a reduction of greenhouse gas emissions of 6% below 1990 levels by 2012. However, the act does not legislate a cap-and-trade system or carbon tax. Several other government initiatives designed to reduce emissions are also listed:

- The act creates an emissions registry, where individuals and corporations can list their emissions and the emissions offsets they have obtained.
- Additionally, the legislation calls for new private vehicle standards and residential furnace and boiler efficiency standards.
- A section of the act requires landfill owners and operators to prepare a plan to mitigate and measure landfill greenhouse gas emissions.

Manitoba Hydro also has some requirements to fulfill under the act: coal must be phased out and can only be used in emergency operations. Manitoba Hydro also has the responsibility of preparing a report on ways to power off-grid communities without using petroleum-based fuels (Manitoba 2008b).

Alternative Energy

The Manitoba government is offering a suite of incentives to promote the use of geothermal power. Geothermal systems use a heat pump to take advantage of the earth's natural heating to heat buildings. There are grants and concessional financing available. New or existing homes that install a geothermal system are eligible for up to $5,000 split between a $2,400 tax credit and a maximum $2,600 grant. Owners of commercial buildings who install a geothermal system are eligible for funds up to 15% of the value of geothermal systems. If a district geothermal system is built, it is eligible for up to a $150,000 grant and up to a 15% refundable tax credit. District systems operate on the principle of economies of scale. By creating a larger system that heats and/or powers a number of buildings, less energy is used than if each individual building generated its own heat and/or power. There are even incentives for heat pump manufacturers in Manitoba. They can receive grants worth up to 7.5% of the price of the geothermal systems they manufacture. Manitoba Hydro also offers homeowners concessionary loans worth up to $20,000 at 4.9% for new installations and retrofits (Manitoba Innovation, Energy and Mines 2011; Manitoba Hydro 2012a).

Manitoba offers a Green Energy Equipment Tax Credit available to individuals who install solar thermal energy systems. A refundable 10% credit is available on eligible capital costs to install the system (the costs of the system as well as taxes and other costs [Manitoba Finance 2012a]).

The Manitoba government has mandated biofuel use within the province. Starting in 2008, ethanol must be blended with gasoline to make up, on average, 8.5% of the total solution. Starting in 2009, biodiesel must be blended with regular diesel to make up, on average, 2% of the total solution (Manitoba Innovation, Energy and Mines 2008; Manitoba Innovation, Energy and Mines 2009).

Additionally, the Manitoba government is offering biofuel grants. Biodiesel made in Manitoba that meets appropriate quality standards and that is sold in Manitoba or exported is eligible for a 14-cent-per-litre subsidy. The subsidy is available from April 1, 2010 to March 31, 2015. There is an annual quantity cap of 20 million litres of eligible production as well as quarterly quantity caps (Manitoba Innovation, Energy and Mines 2009). There are also subsidies for ethanol to be mixed with gasoline. In 2008 and 2009, subsides were $0.20/litre for fuel produced and sold in Manitoba. Since 2010, the subsidies have been $0.15/litre. From 2013 to 2015, the subsidies will fall to $0.10/litre. The ethanol subsidies are capped, in the aggregate, at the amounts needed to meet the legislated requirements for blending with gasoline (Manitoba Innovation, Energy and Mines 2007).

Manitoba is also helping encourage the production and consumption of biomass. The Biomass Energy Program is providing consumer support from January 1, 2012 to March 31, 2012. To encourage people or companies currently burning coal to switch to biomass, up to $20 per tonne of biomass bought up to $12,000 per applicant will be paid.

The exact amount of the incentive is determined by the difference between previous coal purchases and current biomass purchases. There is also a capital support program, which gives coal users a reason to upgrade the capital and infrastructure necessary to use biomass instead of coal, and also for biomass processors to improve their facilities. Improvements must be made between April 1, 2011 and March 31, 2012. Funding is capped at 50% of total cost and $50,000 per project (Manitoba Agriculture 2012a).

To further encourage people who use coal for space and water heating to switch to biomass, Manitoba has introduced a coal tax, effective January 1, 2012. In order to reduce greenhouse gas emissions, Manitoba is planning on banning the use of coal in 2014. Until then, coal will be taxed at a minimum rate of $10/tonne of CO_2 equivalent emissions (Manitoba Agriculture 2012b).

Research and Development

Manitoba offers a Research and Development Tax Credit for qualifying expenditures. The 20% tax credit can be applied against Manitoba corporate income tax. It can be used in the year it is earned or carried forward up to 10 years, or back up to three years. If the corporation has a permanent establishment in Manitoba and the research and development is carried out in Manitoba, the credit is fully or partially refundable. It is fully refundable if the research and development is contracted out to a qualifying research institute. As of 2011, 25% of the credit was refundable if the research was carried out in house instead of contracted out. In 2012,the refundable portion of the credit doubled to 50% (Manitoba Finance 2012b).

Energy Efficiency and Conservation

There is a provincial energy efficiency program for residences run through Manitoba Hydro, a Crown corporation. Power Smart mostly involves government loans to facilitate upgrading to more energy-efficient technology. For example, the government will provide a loan of up to $20,000 to finance a geothermal heat pump. A variety of upgrades to windows and doors, space heating equipment, insulation, lighting, and water conservation, among others, are eligible for a loan of up to $7,500. Up to $5,500 of that amount could be put toward a new high-efficiency natural gas furnace. Up to $7,500 is available for solar water heating upgrades for residences. Manitoba Hydro also offers a Lower Income Energy Efficiency program. Those making approximately 125% of the Statistics Canada Low-Income Cutoff (LICO) level are eligible to take part. Participants receive free insulation upgrades; a high-efficiency furnace for $19/month for a fixed term; and a free energy efficiency review and some energy-saving items (e.g., low flow showerheads and compact fluorescent lights) (Manitoba Hydro 2012b).

The provincial government has partnered with the Manitoba Trucking Association and the University of Manitoba Transport Institute to create the Green Trucking Program. The program provides incentives for companies and owner/operators to upgrade the energy efficiency of their trucks and reduce their greenhouse gas emissions. Successful applicants must invest at least $1,500 in upgrading their trucks to be eligible. Rebates fall between 15% and 25% and maximize out at $2,500 per unit (Manitoba 2011).

Energy Production Policies

General

Manitoba offers a provincial sales tax exemption on some equipment. Drilling or well-servicing rigs used for oil and gas exploration or development, or servicing wells are exempt. Also exempt are geophysical survey and exploration equipment. Chemicals and other materials that enhance incremental crude oil extraction or decontaminate oil and gas are also exempt from the provincial sales tax of 7% (Manitoba 2007).

Manitoba Natural Resource Revenue

Fiscal Year	Oil and Natural Gas Tax (Freehold) (millions)	Petroleum Royalties and Fees (millions)	Oil Lease Revenue (millions)
2009–2010	$8.088	$12.649	$6.027
2008–2009	$10.832	$16.217	$5.249
2007-2008	$10.162	$8.489	$0.583
2006-2007	$13.659	$6.207	$1.381
2005-2006	$7.009	$9.822	$6.410
2004-2005	$3.195	$4.781	$2.013
2003-2004	$2.786	$2.990	$0.220
2002-2003	$2.711	$3.748	$0.349

Note: Manitoba government reports.

Oil

In Manitoba, oil royalty rates are determined by volume and contingent upon the "type" of oil produced. Royalty rate formulae are not price sensitive. All other western provinces have price sensitive formulae.

Oil is classified into one of four categories based on when the well was drilled, whether the well is engaging in an enhanced recovery project, whether the well was abandoned and re-entered and whether or not the oil well fits various drilling incentive programs. Depending on which criteria are met, oil is classified as old, new, third tier or holiday. The maximum royalty rates are: approximately 21% for third tier oil, approximately 25% for new oil and approximately 45% for old oil (Manitoba 2008a).

Freehold taxes on lands without a Crown interest are also based on volume and type of oil. Holiday oil is exempt until the holiday oil volume is used up (see following paragraphs for description of how holiday oil volumes are calculated). Based on differing production thresholds, all three other types of oil are eligible for a minimum 0% freehold tax rate. Third tier oil tax rates maximize out at 11%, new oil tax rates maximize out at approximately 20%, and new oil tax rates maximize out at approximately 43% (Manitoba 2008a).

Holiday oil is not charged a royalty or freehold tax until the well produces a certain amount of oil determined under one of the various drilling incentive programs (at which point, it is no longer considered holiday oil). All new wells drilled prior to January 1, 2014 are eligible for a holiday oil volume. The volume is contingent upon the distance from other existing wells and the average price of oil for the month in which the well was drilled. Additionally, the new well incentive is enhanced if new wells are of a sufficient depth to penetrate the Devonian Duperow Formation, or if the well is completed from a formation deeper than the Devonian Three Forks Formation. In the former case, the holiday oil volume is doubled; in the latter case, the holiday volume may be increased to a maximum of 10,000 m^3 (Manitoba 2008a).

Horizontal wells are also eligible for holiday volumes. Any horizontal well drilled before January 1, 2014 is eligible for 10,000 m^3 holiday volume. The first horizontal leg drilled from a horizontal well between January 1, 2009 and January 1, 2014 is eligible for a holiday volume of 3,000 m^3 (Manitoba 2008a).

Another Manitoba drilling incentive program is for marginal wells. These are wells that have been abandoned, shut-in for the prior year or, on average, produced oil at a rate of less than 1 m^3 per operating day. To be eligible, the well must have undergone a major workover (e.g., re-entry or deepening of existing well) designed to increase recovery. Any oil produced after the workover will be charged third tier oil royalties (Manitoba 2008a).

Finally, the Manitoba government has put in place an Injection Well Incentive. Any wells drilled or converted to water injection are eligible for a year sabbatical from royalties or freehold taxes. If a converted well has holiday oil volume remaining under another incentive program, then the holiday oil volume can be used to extend the exemption period from a year to 18 months (Manitoba 2008a).

Natural Gas

Minimal natural gas is produced in Manitoba. Royalties on natural gas are equal to 12.5% of the volume sold in a given month while the freehold tax is equal to 1.2% of the monthly volume sold. Manitoba does not offer any natural gas cost allowances or natural gas royalty programs (Manitoba 2008a).

References

Alberta. 2003. *Alberta Petroleum Royalty Guidelines: Principles and Procedures*. www.energy.alberta.ca/Oil/pdfs/PetroleumRoyaltyGuidelines.pdf. Accessed March 6, 2012.

Alberta. 2007. *Bioenergy Producer Credit Program Guidelines*. www.energy.alberta.ca/BioEnergy/pdfs/Bioenergy_Producer_Credit_Program_Guidelines.pdf. Accessed March 6, 2012. Accessed March 6, 2012.

Alberta. 2008a. *Biorefining Commercialization and Market Development Program Guidelines*. www.energy.alberta.ca/BioEnergy/pdfs/BCMDProgramGuidelines.pdf. Accessed June 15, 2011.

Alberta. 2008b. *Biorefining Commercialization and Market Development Program Guidelines (Amended December 2008).* www.energy.alberta.ca/BioEnergy/pdfs/Phase2_BCMDP_Guidelines.pdf Accessed. June 15, 2011.

Alberta. 2008c. *Bioenergy Infrastructure Development Program Guidelines.* www.energy.alberta.ca/BioEnergy/pdfs/BIDProgramGuidelines.pdf. Accessed June 15, 2011.

Alberta. 2008d. *Alberta's 2008 Climate Change Strategy: Responsibility/Leadership/Action*. www.environment.gov.ab.ca/info/library/7894.pdf. Accessed March 6, 2012.

Alberta. 2010. *Backgrounder: Emerging Resources and Technologies Initiative*. www.alberta.ca/acn/201005/28441DB838B27-0336-BB5C-D5EDFEDE158ED1F6.html. Accessed March 6, 2012.

Alberta. 2011a. *Bitumen Refinery Agreement Promotes Value-Added Development*. www.alberta.ca/acn/201102/299142F005558-0884-CE61-EBD4608FE8C36216.html. Accessed March 6, 2012.

Alberta. 2011b. *Renewable Fuels Standard—Frequently Asked Questions.* www.energy.alberta.ca/BioEnergy/1517.asp. Accessed March 6, 2012.

Alberta. 2011c. *Alberta To Expand Ethane Incentive*. www.alberta.ca/acn/201103/30115E426C4C3-F72A-F4D6-FFC522BDF9E535CF.html. Accessed March 6, 2012.

Alberta Advanced Education and Technology. 2011. *Alberta Scientific Research and Experimental Development Tax Credit.* www.aet.alberta.ca/technology/support/taxcredit.aspx. Accessed March 6, 2012.

Alberta Energy. 2005. *Conventional Enhanced Oil Royalty Guidelines*. http://www.energy.gov.ab.ca/Oil/pdfs/EOR_GuidelinesAugust2005.pdf. Accessed March 6, 2012.

Alberta Energy. 2006. *Alberta Oil Sands Royalty Guidelines: Principles and Procedures*. http://www.energy.alberta.ca/OilSands/pdfs/GDE_osr.pdf. Accessed March 6, 2012.

Alberta Energy. 2008. *Gas Royalty Calculation New Royalty Framework (NRF): Natural Gas Deep Drilling Program (NGDDP)*. www.energy.alberta.ca/NaturalGas/Gas_Pdfs/NRF_NGDeepDrillProg.pdf. Accessed March 6, 2012.

Alberta Energy. 2009a. *Information Bulletin 2009-03*. www.energy.alberta.ca/Oil/pdfs/Deep_Oil_Exploratory_Well_Regulation.pdf. Accessed March 6, 2012.

Alberta Energy. 2009b. *Valuing Bitumen for the BRIK Program*. www.energy.gov.ab.ca/Org/pdfs/ValuBitumenBRIKdiscuss.pdf. Accessed March 6, 2012.

Alberta Energy. 2010. *Competitiveness Review Changes: Oil & Gas Royalty Operations*. www.energy.alberta.ca/Org/pdfs/IndustryTrainingOctober2010.pdf. Accessed March 6, 2012.

Alberta Energy. 2011. *Oil and Gas Fiscal Regimes: Western Canadian Provinces and Territories June 2011*. www.energy.gov.ab.ca/Tenure/pdfs/FISREG.pdf. Accessed March 5, 2012.

Alberta Energy. 2011a. *About Coal Royalties*. www.energy.alberta.ca/coal/658.asp. Accessed March 6, 2012.

Alberta Energy. 2011b. *Bioenergy Producer Credit Program Frequently Asked Questions*. http://www.energy.alberta.ca/BioEnergy/1826.asp. Accessed March 7, 2012.

Alberta Energy. 2011c. *Drilling Royalty Credit Frequently Asked Questions.* www.energy.alberta.ca/About_Us/1558.asp. Accessed March 6, 2012.

Alberta Energy. 2011d. *Innovative Energy Technologies Program (IETP) Application Package Round Six*. www.energy.alberta.ca/Oil/docs/IETP_Application_Round_6.doc. Accessed March 6, 2012.

Alberta Environment and Water. 2012. *Greenhouse Gas Reduction Program*. www.environment.alberta.ca/01838.html. Accessed March 6, 2012.

Alberta Innovates. 2011a. *Major Programs*. www.ai-ees.ca/home/initiatives/programs. Accessed March 6, 2012.

Alberta Innovates. 2011b. *Innovation Vouchers Program: Program Guide.* www.albertatechfutures.ca/LinkClick.aspx?fileticket=bcaz5QmWVTU%3d&tabid=563. Accessed March 6, 2012.

Alberta Ministry of Environment. 2010. *Environmental Protection Security Fund Annual Report*. www.environment.alberta.ca/documents/EPSF_AnnualReport.pdf. Accessed March 6, 2012.

BC Hydro. 2010. *Clean Power Call Request for Proposals: Report on the RFP Process*. www.bchydro.com/etc/medialib/internet/documents/planning_regulatory/acquiring_power/2010q3/cpc_rfp_process_report.Par.0001.File.CPC_RFP_Process_Report_August_3_2010.pdf. Accessed March 5, 2012.

BC Hydro. 2011a. *Clean Power Call*. www.bchydro.com/planning_regulatory/acquiring_power/clean_power_call.html. Accessed March 5, 2012.

BC Hydro. 2011b. *Power Smart New Home Program*. www.bchydro.com/powersmart/builders_developers/new_home_program.html. Accessed March 6, 2012.

BC Renaissance Capital Fund. 2011. *About BCRCF.* www.bcrcf.ca/bcrcf/about/index.html. Accessed March 5, 2012.

British Columbia. 2008. *Greenhouse Gas Reduction Targets Act*. www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_07042_01. Accessed March 5, 2012.

British Columbia. 2009a. *BC-22 Application for Producer Cost of Service*. www.rev.gov.bc.ca/documents_library/forms/BC22guidelines.pdf. Accessed March 5, 2012.

British Columbia. 2009b. *BC-23 Application for Gas Cost Allowance*. www.rev.gov.bc.ca/documents_library/forms/BC23guidelines.pdf. Accessed March 5, 2012. Accessed March 5, 2012.

British Columbia. 2010. *Bill 17 – 2010 Clean Energy Act*. www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_10022_01. Accessed March 5, 2012.

British Columbia. 2011. *LiveSmart BC: Small Business Program Components*. www.livesmartbc.ca/incentives/small-business/program_components.html. Accessed March 6, 2012.

British Columbia, Alberta and Saskatchewan. 2010. *Memorandum of Understanding Collaboration on Energy Initiatives*. www.energy.alberta.ca/Org/pdfs/NWPEnergyMOUFinal.pdf. Accessed March 5, 2012.

British Columbia Ministry of Aboriginal Relations and Reconciliation. 2011. *Guidelines for Funding from the First Nations Clean Energy Business Fund*. www.gov.bc.ca/arr/economic/down/fncebf_guidelines_april14_2011.pdf. Accessed March 5, 2012.

British Columbia Ministry of Energy and Mines, BC Hydro and Forits BC. *2011 LiveSmartBC.ca Efficiency Incentive Program: Energy Efficiency Really Pays*. www.livesmartbc.ca/attachments/LiveSmart-Home-Incentives.pdf. Accessed March 6, 2012.

British Columbia Ministry of Energy and Mines. 2011a. *Renewable and Low Carbon Fuel Requirements Regulation*. www.empr.gov.bc.ca/RET/RLCFRR/Pages/default.aspx. Accessed March 5, 2012.

British Columbia Ministry of Energy and Mines. 2011b. *About the ICE Fund*. www.em.gov.bc.ca/EAED/ICEFUND/Pages/About.aspx. Accessed March 5, 2012.

British Columbia Ministry of Energy, Mines and Petroleum. 2007a. *The BC Energy Plan: A Vision for Clean Energy Leadership*. www.energyplan.gov.bc.ca/PDF/BC_Energy_Plan.pdf. Accessed March 5, 2012.

British Columbia Ministry of Energy, Mines and Petroleum. 2007b. *BC Bioenergy Strategy: Growing Our Natural Energy Advantage*. www.energyplan.gov.bc.ca/bioenergy/PDF/BioEnergy_Plan_005_0130_web0000.pdf. Accessed March 5, 2012.

British Columbia Ministry of Energy, Mines and Petroleum. 2009. *Net Profit Royalty Program*. www.empr.gov.bc.ca/OG/OILANDGAS/ROYALTIES/NETPROFITROYALTYPROGRAM/Pages/default.aspx. Accessed March 6, 2012.

British Columbia Ministry of Energy, Mines and Petroleum. 2010. *Feed In Tariff Regulation Consultation Paper*. www.empr.gov.bc.ca/RET/RenewableEnergyTechnologies/Documents/Feed%20In%20Tariff%20Consultation%20Paper.pdf. Accessed March 6, 2012.

British Columbia Ministry of Environment. 2011. *Public Sector Energy Conservation Agreement*. www.env.gov.bc.ca/cas/mitigation/pseca.html. Accessed March 6, 2012.

British Columbia Ministry of Finance. 2009. *Mineral Tax Handbook*. www.sbr.gov.bc.ca/business/natural_resources/Mineral_Tax/MinTax_Handbook.pdf. Accessed March 6, 2012.

British Columbia Ministry of Finance. 2010a. *Tax Bulletin: British Columbia Scientific Research and Experimental Development Tax Credit.* www.sbr.gov.bc.ca/documents_library/bulletins/cit_007.pdf. Accessed March 5, 2012.

British Columbia Ministry of Finance. 2010b. www.sbr.gov.bc.ca/documents_library/bulletins/PNG002.pdf. Accessed March 5, 2012.

British Columbia Ministry of Finance. 2011. *How the Carbon Tax Works*. www.fin.gov.bc.ca/tbs/tp/climate/A4.htm. Accessed March 7, 2012.

British Columbia Office of the Premier. 2008. *Municipalities Receive Climate Action Incentive*. www2.news.gov.bc.ca/news_releases_2005-2009/2008OTP0235-001451.htm. Accessed March 5, 2012.

British Columbia Office of the Premier and British Columbia Ministry of Science and Universities. 2011. *Year of Science Legacy, Research Awards Announced*. www.yearofsciencebc.ca/assets/Documents/NRYoSLegacyResearchAwards20110223.pdf. Accessed March 5, 2012.

C3. 2011. *My Rebates*. www.climatechangecentral.com/my-rebates/available-rebates. March 6, 2012.

Canada. 2010. *ecoENERGY for Renewable Power*. www.ecoaction.gc.ca/ecoenergy-ecoenergie/power-electricite/index-eng.cfm. Accessed March 5, 2012.

Canada. 2011a. US-Canada Clean Energy Dialogue. www.climatechange.gc.ca/Dialogue/default.asp?lang=En&n=E47AAD1C-1. Accessed March 5, 2012.

Canada. 2011b. *ecoENERGY Renewable Fuels Strategy*. www.ecoaction.gc.ca/ecoenergy-ecoenergie/renewablefuels-carburantsrenouvelables-eng.cfm. Accessed March 5, 2012.

Canada. 2011c. *The Next Phase of Canada's Economic Action Plan: A Low-Tax Plan for Jobs and Growth*. www.budget.gc.ca/2011/plan/Budget2011-eng.pdf. Accessed March 5, 2012.

Canada Revenue Agency. 2008. *Flow-Through Shares (FTSs)*. www.cra-arc.gc.ca/tx/bsnss/tpcs/fts-paa/menu-eng.html. Accessed March 5, 2012.

Canada Revenue Agency. 2009. *Scientific Research and Experimental Development: About Our Program*. www.cra-arc.gc.ca/txcrdt/sred-rsde/bts-eng.html. Accessed March 5, 2012.

Canada Revenue Agency. 2010. *Renewable Energy and Energy Conservation*. www.cra-arc.gc.ca/tx/bsnss/tpcs/fts-paa/nrgy-eng.html. Accessed March 5, 2012.

Department of Finance Canada. 2003. *Improving the Income Taxation of the Resource Sector in Canada*. www.fin.gc.ca/activty/pubs/rsc_1-eng.asp. Accessed March 5, 2012.

Enterprise Saskatchewan. 2009. *Research and Development Tax Credit in Saskatchewan.* www.enterprisesaskatchewan.ca/RD-TaxCredit. Accessed March 6, 2012.

Enterprise Saskatchewan. 2010. *Saskatchewan Business Incentives 2010*. www.enterprisesaskatchewan.ca/Business-Incentives. Accessed March 6.

EnviroEconomics Inc., Dave Sawyer and Seton Stiebert. 2010. *Fossil Fuels—At What Cost? Government Support for Upstream Oil Activities in Three Canadian Provinces: Alberta, Saskatchewan, and Newfoundland and Labrador.* www.iisd.org/gsi/sites/default/files/ffs_awc_3canprovinces.pdf. Accessed March 5, 2012.

Environment Canada, Department of Finance Canada, Fisheries and Oceans Canada, Health Canada, Indian and Northern Affairs Canada and Natural Resources Canada. 2008. *Impact of Oil Sands Development in Alberta.* www.oag-bvg.gc.ca/internet/English/pet_215_e_28951.html. Accessed March 5, 2012.

Geoscience BC. 2011. *About Us.* www.geosciencebc.com/s/AboutUs.asp. Accessed March 5, 2012.

Manitoba. 2007. *The Retail Sales Tax Act Oil Producers, Oil Well Drilling and Service Contractors*. Information Bulletin 45. www.gov.mb.ca/finance/taxation/bulletins/045.pdf. Accessed March 7, 2012.

Manitoba. 2008a. *Manitoba Petroleum Fiscal Regime December 2008.* http://www.gov.mb.ca/stem/petroleum/regime/regime.pdf. Accessed March 7, 2012.

Manitoba. 2008b. *The Climate Change and Emissions Reductions Act*. http://web2.gov.mb.ca/laws/statutes/ccsm/c135e.php. Accessed March 7, 2012.

Manitoba. 2010. *Building Code Changes to Make Homes More Energy Efficient: Howard*. http://news.gov.mb.ca/news/index.html?item=9961. Accessed March 7, 2012.

Manitoba. 2011. *Manitoba Green Trucking Program*. www.greeentrucking.ca/index.php. Accessed March 7, 2012.

Manitoba Agriculture. 2012a. *Questions and Answers: Manitoba Biomass Energy Support Program.* www.gov.mb.ca/agriculture/agrienergy/pdf/mbesp_questionsandanswers.pdf. Accessed March 7, 2012.

Manitoba Agriculture. 2012b. *Questions and Answers: Emissions Tax on Coal*. www.gov.mb.ca/agriculture/agrienergy/pdf/coal_taxquestionsandanswers.pdf. Accessed March 7, 2012.

Manitoba Conservation. 2012. *Sustainable Development Innovations Fund (SDIF) Open Category.* www.gov.mb.ca/conservation/pollutionprevention/sdif/sdifopen.html. Accessed March 7, 2012.

Manitoba Finance. 2012a. *Green Energy Equipment Tax Credit*. www.gov.mb.ca/finance/tao/green.html. Accessed March 7, 2012.

Manitoba Finance. 2012b. *Corporate Tax Credits*. www.gov.mb.ca/finance/ccredits.html. Accessed March 7, 2012.

Manitoba Green Building Policy Interdepartmental Working Group. 2008. *Green Building Policy for Government of Manitoba Funded Projects.* www.gov.mb.ca/mit/greenbuilding/pdf/policy.pdf. Accessed March 7, 2012.

Manitoba Hydro. 2012a. *Residential Earth Power Loan*. www.hydro.mb.ca/earthpower/loan.shtml. Accessed March 7, 2012.

Manitoba Hydro. 2012b. *Power Smart Savings, Rebates and Loans*. www.hydro.mb.ca/your_home/savings_home.shtml?WT.mc_id=2056. Accessed March 7, 2012.

Manitoba Innovation, Energy and Mines. 2007. *Manitoba's Ethanol Program*. www.manitoba.ca/iem/energy/biofuels/ethanol/files/manitoba_ethanol_program.pdf. Accessed March 7, 2012.

Manitoba Innovation, Energy and Mines. 2008. *Ethanol*. www.manitoba.ca/iem/energy/biofuels/ethanol/index.html. Accessed March 7, 2012.

Manitoba Innovation, Energy and Mines. 2009. *Biodiesel*. www.manitoba.ca/iem/energy/biofuels/biodiesel/index.html. Accessed March 7, 2012.

Manitoba Innovation, Energy and Mines. 2011. *Manitoba Geothermal Energy Incentive Program*. www.manitoba.ca/iem/energy/geothermal/incentives.html. Accessed March 7, 2012.

Ministry of Energy and Resources. 2010h. *Information Circular PR-IC13: Recovered Crude Oil Tax Structure*. www.er.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=5756,5755,3430,3384,5460,2936,Documents&MediaID=29759&Filename=pr-ic13.pdf. Accessed March 6, 2012.

Ministry of Energy and Resources. 2010i. *Information Circular PR-IC12: Royalty/Tax Program for High Water-Cut Oil Wells.* www.er.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=5756,5755,3430,3384,5460,2936,Documents&MediaID=29758&Filename=pr-ic12.pdf. Accessed March 6, 2012.

Ministry of Energy and Resources. 2010j. *Information Circular PR-IC06: Royalty/Tax Regime for Incremental Oil Produced from New or Expanded Waterflood Projects Implemented on or after October 1, 2002*. www.er.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=5756,5755,3430,3384,5460,2936,Documents&MediaID=29751&Filename=pr-ic06.pdf. Accessed March 6, 2012.

National Research Council. 2011. *Financial Assistance*. www.nrc-cnrc.gc.ca/eng/services/irap/financial-assistance.html. Accessed March 5, 2012.

Natural Resources Canada. 2009. *CanmetENERGY: About Us*. www.canmetenergy.nrcan.gc.ca/about/1226. Accessed March 5, 2012.

Natural Resources Canada 2010a. *Program of Energy Research and Development*. www.nrcan.gc.ca/eneene/science/perdprde-eng.php. Accessed March 5, 2012.

Natural Resources Canada. 2010b. *ISO 50001 Implementation Support: Incentives*. www.oee.nrcan.gc.ca/industrial/financial-assistance/assessment/index.cfm?attr=0. Accessed March 5, 2012.

Natural Resources Canada 2011a. *Clean Energy Fund Program*. www.nrcan.gc.ca/eneene/science/ceffep-eng.php. Accessed March 5, 2012.

Natural Resources Canada. 2011b. *ecoENERGY Technology Initiative*. www.nrcan.gc.ca/eneene/science/etiiet-eng.php. Accessed March 5, 2012.

Petroleum Technology Research Centre. 2012. *About PTRC*. www.ptrc.ca/about.php. Accessed March 6, 2012.

Saskatchewan. 2010. *An Act Respecting the Management and Reduction of Greenhouse Gases and Adaptation to Climate Change*. www.qp.gov.sk.ca/documents/english/Chapters/2010/M2-01.pdf. Accessed March 8, 2012.

Saskatchewan. 2011a. *Saskatchewan EnerGuide for Houses: Chart of Eligible Retrofits.* www.saskenergy.com/Saving_Energy/NEW%20grant%20chart%20(March%208%202011)-formatting%20&%20new%20date.pdf. Accessed March 7, 2012.

Saskatchewan. 2011b. *Incentives and Initiatives: The Saskatchewan Oil and Gas Industry Upstream Emission Reduction Initiative*. www.er.gov.sk.ca/Default.aspx?DN=56b82248-d453-4f75-90f2-0a12ec55707c. Accessed March 6, 2012.

Saskatchewan. 2011c. *Coal Information Circular*. www.er.gov.sk.ca/Default.aspx?DN=a3fa9a7c-f9c1-4ae8-8900-4aece0581839. Accessed March 7, 2012.

Saskatchewan. 2011d. *News Release: Renewable Diesel Program Launched*. www.gov.sk.ca/news?newsId=7f253391-07b3-41a2-a0a2-b8f7d3e9a12a. Accessed March 6, 2012.

Saskatchewan Finance. 2003a. *Information Bulletin CT-2: The Corporation Capital Tax Act Allowable Deductions*. www.finance.gov.sk.ca/revenue/cct/bulletins/CT-2%20Allowable%20Deductions.pdf. Accessed March 6, 2012.

Saskatchewan Finance. 2003b. *Information Bulletin FT-11: Fuel Tax Rebate for Mineral Exploration*. www.finance.gov.sk.ca/taxes/ft/bulletins/FT-11%20Fuel%20Tax%20Rebate%20for%20Mineral%20Exploration.pdf. Accessed March 6, 2012.

Saskatchewan Finance. 2005. *Information Bulletin PST-13:Oil, Gas and Potash Drilling and Service Contractors.* www.finance.gov.sk.ca/revenue/pst/bulletins/PST-13%20Oil%20and%20Gas%20Contractors.pdf. Accessed March 6, 2012.

Saskatchewan Finance. 2006. *Infomation Bulletin PST-14: Information for Oil and Natural Gas Producers*. www.finance.gov.sk.ca/revenue/pst/bulletins/PST-14%20Oil%20and%20Gas%20Producers.pdf. Accessed March 6, 2012.

Saskatchewan Finance. 2011a. *Information Bulletin CT-3: The Coporation Capital Tax Act Corporation Capital Tax Resource Surcharge*. www.finance.gov.sk.ca/revenue/cct/bulletins/CT-3%20Corporation%20Capital%20Tax%20Resource%20Surcharge.pdf. Accessed March 6, 2012.

Saskatchewan Finance. 2011b. *Application for Rebate of Provincial Sales Tax on Energy-Efficient Household Appliances.* www.finance.gov.sk.ca/forms/FI-1460%20PST%20Rebate%20on%20New%20Energy%20Efficient%20Household%20Appliances.pdf. Accessed March 6, 2012.

Saskatchewan Government Insurance. 2011. *Saskatchewan Government Rewards Green Drivers with SGI Rebates*. www.sgi.sk.ca/about/newsreleases/2011/greenrebate.html. Accessed March 7, 2012.

Saskatchewan Ministry of Energy and Resources. 2009. *Saskatchewan's Strategic Approach to Carbon Dioxide Capture and Storage*. March 6 presentation. www.er.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=10291,10289,3384,5460,2936,Documents&MediaID=25534&Filename=SER+CO2+Info+Opening+Remarks+(Mar+6+09).pdf. Accessed March 6, 2012.

Saskatchewan Ministry of Energy and Resources. 2010a. *Information Circular PR-IC-01: Crude Oil Price Sensitive Royalty/Tax Structures*. www.er.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=5756,5755,3430,3384,5460,2936,Documents&MediaID=29746&Filename=pr-ic01.pdf. Accessed March 6, 2012.

Saskatchewan Ministry of Energy and Resources. 2010b. *Information Circular PR-IC02: Natural Gas Price Sensitive Royalty/Tax Structures*. www.er.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=5756,5755,3430,3384,5460,2936,Documents&MediaID=29747&Filename=pr-ic02.pdf. Accessed March 6, 2012.

Saskatchewan Ministry of Energy and Resources. 2010c. *Information Circular PR-IC03: Royalty/Tax Incentive Volumes for Vertical Oil Wells Drilled on or After October 1, 2002*. www.er.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=5756,5755,3430,3384,5460,2936,Documents&MediaID=39400&Filename=pr-ic03.pdf. Accessed March 6, 2012.

Saskatchewan Ministry of Energy and Resources. 2010d. *Information Circular PR-IC05: Royalty/Tax Incentive Volumes for Horizontal Oil Wells*. www.er.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=5756,5755,3430,3384,5460,2936,Documents&MediaID=39402&Filename=pr-ic05.pdf. Accessed March 6, 2012.

Saskatchewan Ministry of Energy and Resources. 2010e. *Information Ciruclar PR-IC11: Royalty/Tax Regime Applicable to Enhanced Oil Recovery Projects (Excluding Wateflood Projects).* www.er.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=5756,5755,3430,3384,5460,2936,Documents&MediaID=29756&Filename=pr-ic11.pdf. Accessed March 6, 2012.

Saskatchewan Ministry of Energy and Resources. 2010f. *Information Circular PR-IC04 Royalty/Tax Incentive Volume For Exploratory Gas Wells Drilled on or After October 1, 2002.* www.er.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=5756,5755,3430,3384,5460,2936,Documents&MediaID=39401&Filename=pr-ic04.pdf. Accessed March 6, 2012.

Saskatchewan Ministry of Energy and Resources. 2010g. *Information Circular PR-IC14 Royalty/Tax Incentive Volumes for Horizontal Gas Wells Drilled on or after June 1, 20102 and before April 1, 2013.* www.er.gov.sk.ca/adx/aspx/adxGetMedia.aspx?DocID=5756,5755,3430,3384,5460,2936,Documents&MediaID=29760&Filename=pr-ic14.pdf. Accessed March 6, 2012.

Saskatchewan Ministry of Energy and Resources. 2011. *Saskatchewan Petroleum Research Incentive (SPRI): Information for Applicants*. www.er.gov.sk.ca/SPRI-Applicant-Information. Accessed March 6, 2012.

Saskatchewan Ministry of the Environment. 2009. *Summary of an Act Respecting the Management and Reduction of Greenhouse Gases and Adaptation to Climate Change (Bill 126).* www.environment.gov.sk.ca/adx/aspx/adxgetmedia.aspx?MediaID=3207&Filename=Summary%20of%20Climate%20Change%20Act%20-%20Bill%20126.pdf. Accessed March 6, 2012.

Saskatchewan Research Council. 2011a. *Enhanced Oil Recovery Processes and Field Development.* www.src.sk.ca/html/research_technology/energy/enhanced_recovery_technologies/index.cfm. Accessed March 6, 2012.

Saskatchewan Research Council. 2011b. *Municipal Energy Conservation Program*. www.src.sk.ca/html/research_technology/energy_conservation/municipal_energy/index.cfm. Accessed March 7, 2012.

Saskatchewan Research Council. 2011c. *Overview*. www.saskcleans.ca/html/overview/index.cfm. Accessed March 6, 2012.

SaskEnergy. 2011a. *Energy Efficient Rebate for New Homes*. www.saskenergy.com/saving_energy/energystarnewhomes.asp. Accessed March 7, 2012.

SaskEnergy.2011b. *Commercial HVAC Program*. www.saskenergy.com/Business/hvac.asp. Accessed March 7, 2012.

SaskPower. 2011a. *Net Metering Program*. www.saskpower.com/sustainable_growth/generate_move_power/net_metering/. Accessed March 6, 2012.

SaskPower. 2011b. *Small Power Producers Program*. www.saskpower.com/sustainable_growth/generate_move_power/small_power_producers/. Accessed March 6, 2012.

SaskPower. 2011c. *Green Options Partners Program Rules*. www.saskpower.com/sustainable_growth/generate_move_power/green_options_partners/rules.shtml. Accessed March 6, 2012.

SaskPower. 2011d. *Geothermal Rebate Program*. www.saskpower.com/save_power/business/programs_offers/geothermal_rebate/. Accessed March 6, 2012.

SaskPower. 2011e. *Residential Programs and Offers*. www.saskpower.com/save_power/residential/programs_and_offers/. Accessed March 6, 2012.

SaskPower. 2011f. *Demand Response Program Offers*. www.saskpower.com/save_power/business/programs_offers/demand_response/offers.shtml. Accessed March 7, 2012.

Sustainable Development Technology Canada. 2011. *About Our Funds*. www.sdtc.ca/index.php?page=about-our-funds&hl=en_CA. Accessed March 5, 2012.

Western Climate Initiative. 2012. *History*. www.westernclimateinitiative.org/history. Accessed March 5, 2012.

Western Economic Diversification. 2011. *Western Economic Partnership Agreements.* www.wd.gc.ca/eng/297.asp. Accessed March 5, 2012.

A Western Voice on National Policy Issues

In 1971, the Canada West Foundation was established to give the people of the West—British Columbia, Alberta, Saskatchewan and Manitoba—a voice for their dreams, interests and concerns. In doing so, the goal was to put the West on the national agenda and be at the forefront of the most important issues and debates.

Since then, the Canada West Foundation has successfully met that goal, proving itself to be one of Canada's premier research institutes. The Canada West Foundation is the only think tank dedicated to being the objective, nonpartisan voice for issues of vital concern to western Canadians.

For over 40 years, we have represented western viewpoints. We are proud of our accomplishments and know that our research and commentary have improved government policy and decision-making.

Today the West is in, but we won't stop there. We continue to promote important issues and debates that provide made-in-the-West solutions to national problems and keep the West thriving.

CANADA IS STRONGER WHEN THE WEST IS THRIVING!

CanadaWest FOUNDATION

Your support makes a difference

Head Office
900–105 12th Avenue SE
Calgary AB T2G 1A1
p: 403.264.9535
888.825.5293

www.cwf.ca
cwf@cwf.ca

Registered Canadian Charitable Organization
(#11882 8698 RR 0001)

CanadaWest FOUNDATION

900–105 12th Avenue SE
Calgary AB T2G 1A1
www.cwf.ca | 403.264.9535