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# Canada

# Bio-Fuels

# Annual Report

# 2008

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**Report Highlights:**
The Canadian government has made the necessary legislative amendments (Bill C-33) to be able to establish a national renewable fuels mandate in the gasoline pool and in diesel fuel by 2010. In addition, federal and new provincial incentive programs designed to encourage the development of a Canadian renewable fuels industry have been introduced. Imports of corn from the US to feed the growing ethanol production in eastern Canada will continue to fluctuate depending on transportation costs and how much corn is available locally. The availability of feed substitutes and a declining livestock industry limits the growth of corn imports from the U.S. North-south trade in co-products has increased. Canada's ethanol production capacity is expected to reach 1.135 billion liters by the end of 2008, a significant jump from the estimated 700 million liters production capacity in 2007. Nevertheless, Canada's entry into the global ethanol market remains distant.

Includes PSD Changes: No
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Table of Contents

## 1. Executive Summary

The Canadian government has made the necessary legislative amendments (Bill C-33) to be able to establish a national renewable fuels mandate in the gasoline pool and in diesel fuel by 2010. In addition federal and new provincial incentive programs designed to encourage the development of a Canadian renewable fuels industry have been introduced. Imports of corn from the US to feed the growing ethanol production in eastern Canada will continue to fluctuate depending on transportation costs and how much corn is available locally. The availability of feed substitutes and a declining livestock industry limits the growth of corn imports from the U.S. North-south trade in co-products has increased. Canada's ethanol production capacity is expected to reach 1.135 billion liters by the end of 2008, a significant jump from the estimated 700 million liters production capacity in 2007. Nevertheless, Canada's entry into the global ethanol market remains distant.

## 2. Domestic Environment

### A. Proposed Biofuels Mandate

In late 2006 Canada's minority Conservative government announced its intention to put in place a renewable fuels strategy, one which would include a national renewable fuels mandate. Since that time, work to bring about the legislative amendments necessary for such a mandate have been brought forth and federal and provincial incentive programs designed to encourage the development of a Canadian renewable fuels industry have been put in place. A Notice of Intent was published in the Canada Gazette Part 1 on December 30th, 2006 detailing the government of Canada's intentions in terms of federal regulations requiring renewable fuels. The mandate the government is proposing in its notice of intent is for an annual renewable content of five percent in the gasoline pool by 2010, and a two percent requirement for renewable fuel in diesel content by 2012, upon the successful demonstration of renewable diesel fuel under a range of Canadian climatic conditions. For this to be possible, since fuel regulations are a shared federal/provincial jurisdiction, provincial endorsement of such a mandate is necessary. Several provinces have or plan to have a provincial renewable fuel mandate in place and most support the national mandate proposal.

### B. Legislation Underpinning a Canadian Biofuel Mandate

In order for the government to be able to bring in a renewable fuels mandate, amendments to the Canadian Environmental Protection Act, 1999 were necessary. On December 3rd, 2007, the Canadian Minister of the Environment, on behalf of Canada's Agriculture Minister, the Honorable Gerry Ritz, introduced legislation into the House of Commons that would enable the government to establish a renewable fuels mandate. Bill C-33 proposed amendments to the Fuels Division (Division 4) of the Canadian Environmental Protection Act of 1999 (CEPA, 1999). These amendments added to the regulation-making power of the federal Cabinet by allowing it to make regulations concerning blended fuels. In addition, the amendments allow for the federal cabinet, on recommendation by the Environment Minister, to make regulations exempting from the prohibition producers or importers of fuel who produced or import a quantity less than $400m^3$ per year. The bill was introduced into Parliament at the beginning of December, but stalled at times in the legislative process due uncertainty on whether it would receive the support needed from the opposition parties in light of the intense food versus fuel debate. Canada's Conservative government has minority status and requires the support from at least one opposition party to be able to move legislation forward.

During the legislative process, additional amendments to the original bill were made by the House Standing Committee on Agriculture and Agri-Food which reviewed the bill and heard witnesses. The most significant change recommended by the Agriculture Committee (and subsequently adopted by the House of Commons) was the inclusion of a clause that a review of the environmental and economic aspects of biofuel production in Canada should be undertaken by a House and/or Senate committee every 2 years after the legislation comes into force. Note, the use of the words "should be undertaken" means the reviews, although recommended, are not mandatory. The purpose of such a review is to reevaluate periodically if the environmental and economics goals and benefits of the bill are being achieved. In late June, Bill C-33 received royal assent. A copy of the bill, transcripts of the debates during second and third reading, as well as the report to the House of Commons submitted by the Standing Committee on Agriculture and Agri-Food are available at the following hyperlink: Bill C-33 status.

### C. Food Versus Fuel Debate in Canada

As mentioned previously, Bill C-33 was being debated in Parliament during the height of the food versus fuel debate. Oddly enough, the surge in the Canadian dollar due to high oil prices and Canada's position as a leading oil producer meant that Canadian consumers were enjoying food price deflation at the time when many countries were facing food shortages and dramatic price increases. It was in March that the fuel versus fuel debate reached its climax. The consumer price index for March 2008 showed that although food prices had increased a slight 0.4% from a year before, they actually decreased slightly from the previous month. In contrast to most other countries, fast rising prices for the raw materials (i.e., mostly the grain based ones) used in food manufacturing were not being passed on to the Canadian consumers. As reported in Gain Report CA8023, there are several reasons for this surprising food price trend, including the strength of the Canadian dollar, high livestock inventories, a price war between food retailers, and supply managed dairy products. While Canadians are seeing gradual increases in food prices it is happening at a more gradual rate. Supply managed products will be passing along increases in their costs of production; retailers will eventually pass on increases to consumers rather than see their profit margins decrease and the oversupply in the livestock industry that is depressing prices will also be relatively short-lived. This more gradual increase in food prices has tempered the food versus fuel debate around ethanol. To also help temper the debate, the Government of Canada made several food aid announcements during the crisis. See GAIN report CA8028 for more details.

### D. Federal Programs to Encourage the Development of a Canadian Renewable Fuels Industry

On March 19th, 2007, Canada's Minister of Finance, tabled a notice of Ways and Means Motion to amend the Excise Tax Act Relating to Excise Taxes. As a result of these changes, the excise tax exemption for renewable fuels was eliminated April 1, 2008.

#### (i) EcoENERGY for Biofuels Program

The EcoEnergy for Biofuels Initiative, for which the March 2007 budget allocated $CAN 1.5 billion over 9 years, is the subsidy program intended to put Canadian ethanol plants on equal footing with U.S. plants. The funding amount was derived based on the establishment of a volume limit of 2 billion liters of renewable alternatives to gasoline and 500 million liters of renewable alternatives to diesel. A cap of 30 percent of the program volume limit per facility (600 million liters and 150 million liters for renewable alternatives to gasoline and diesel, respectively) has also been established. The production incentive program provides incentive

rates of up to $0.10/L for renewable alternatives to gasoline and $0.20/L for renewable alternatives to diesel for the first three years, declining in the 6 years thereafter.

The program was slated to begin on April 1, 2008, but the delivery mechanism was plagued with problems. Some of the shortcomings included a convoluted payment formula that compared individual profitability calculations against a federal model of industry profitability. Other concerns were raised by the provinces such as regional biases, differences created by different feed-stock used, and plant-scale biases. The Canadian Renewable Fuels Association president argued that these issues must be worked out so that the program provides the same level of certainty to investors and lenders that the American model does, or the Canadian biofuels industry would remain at a disadvantage compared to its American counterpart. The delivery mechanism was re-worked, and with the approval of the provinces, the initiative was launched at the end of April, 2008.

The program is administered by Natural Resources Canada. The maximum incentive rates payable are presented in the table below:

**Table 2.1**
**Maximum Payable Incentive Rates*; in $Can per L**

| | 2008-2009 | 2009-2010 | 2010-2011 | 2011-2012 | 2012-2013 | 2013-2014 | 2014-2015 | 2015-2016 | 2016-2017 |
|---|---|---|---|---|---|---|---|---|---|
| **Renewable Alternatives to Gasoline** | 0.10 | 0.10 | 0.10 | 0.08 | 0.07 | 0.06 | 0.05 | 0.04 | 0.04 |
| **Renewable Alternatives to Diesel** | 0.20 | 0.20 | 0.20 | 0.16 | 0.14 | 0.12 | 0.10 | 0.08 | 0.06 |

**by fiscal year; April 1 to March 31*

**Source:** ecoENERGY for Biofuels, Natural Resources Canada;
http://oee.nrcan.gc.ca/transportation/ecoenergy-biofuels/incentive.cfm?attr=16

The program has set parameters which include a requirement that participants enter into a contribution agreement with Natural Resources Canada and complete a satisfactory environmental assessment. Program parameters also define the level of operating incentive based on average industry profitability. The program is designed to decrease incentives when market conditions are such that industry profitability is high and increase incentives when market conditions are poor. For more information on how incentive rates are calculated, please see the following web-address: **incentive rate** .

These supply-side producer incentives are necessary if the Canadian government aims to meet the Canadian renewable fuels mandate through Canadian production and not from imports of ethanol from the United States or Brazil, the two largest ethanol producers in the world. A large body of evidence seems to suggest that without government support, a Canadian grains-based ethanol industry (1$^{st}$ generation ethanol) is, and will remain uncompetitive compared to oil, due to the costs of the necessary inputs. Ethanol is not a primary energy source and is achieved by using energy to convert the energy stored in biological material into ethanol. For this reason, ethanol prices and oil prices move in the same direction. Due to the input energy requirements, the energy and environmental benefits of grain-based ethanol production in Canada is questionable. The notice of intent seems to acknowledge this and implies that this measure is just the first step as the real gains to both the environment and agricultural producers across Canada is through the creation of a bio-economy that will come as a result of breakthroughs in the commercialization of cellulosic technologies.

**(ii) Biofuels Opportunities for Producers Initiative (BOPI) and ecoAGRICULTURE Biofuels Capital Initiative (ecoABC)**

During the witness testimony on Bill C-33 before the House and Senate committees it became clear that despite the "green" rationale for a Canadian biofuels mandate, the science is still out on whether a renewable fuel standard will deliver on its environmental objectives. Despite this, political support for this mandate remains strong since it is viewed as a vehicle to help revitalize rural communities. Several of the programs developed within the federal government's bio-fuel comprehensive strategy are clearly designed to engage Canadian producers. The idea is that producers will be able to increase their incomes and manage risk by diversifying their income sources. The programs are designed to involve, as much as possible, Canadian agricultural producers in the renewable fuels market, as well as in the wider bio-economy that would allow them to find new markets, offset financial losses, and diversify income sources.

Since 2006, the Canadian government has put in place a series of programs to encourage direct producer participation in bio-fuels and the bio-economy. Two programs in particular encourage direct producer involvement in bio-fuels production: the Biofuels Opportunities for Producers Initiative (BOPI) and the ecoAGRICULTURE Biofuels Capital Initiative (ecoABC).

The Biofuels Opportunities for Producers Initiative (BOPI) closed on March 31, 2008. Twenty million dollars of funding had been made available through BOPI since it was first announced in July of 2006. The initiative delivered ten million dollars in funding through the regional industry councils that administer Agriculture and Agri-food Canada's Advancing Canadian Agriculture and Agri-Food Program. The purpose of the program was to help producers hire technical, financial and business planning advisors to assist in developing business proposals to support the creation and expansion of bio-fuels production capacity with significant ownership by agricultural producers. The funding was available for projects with greater than one-third producer ownership. Funding demand was high, and in March of 2007, the Ministry of Agriculture announced that an additional three million dollars would be made available for the 2006-2007 fiscal year, and an additional seven million dollars for fiscal year 2007-2008.

EcoABC is designed to encourage producer equity/ownership in bio-fuel facilities and was first unveiled at the bio-fuels mandate announcement in December 2006 under the unwieldy name "Capital Formation Assistance Program for Renewable Fuels Production". This 4-year, 200 million dollar program was later renamed ecoAGRICULTURE Biofuels Capital Initiative (ecoABC) and provides repayable contributions for the construction or expansion of transportation bio-fuel facilities. Launched in late April 2007, the program helps fund projects that use agricultural feedstock to produce bio-fuels and requires agricultural producer equity investments of 5% to meet the eligibility requirements. The funding increases as producer investment increases, however a contribution cap of 25 million dollar applies. The program ends March 31, 2011.

**(iii) Agricultural Bio-Products Innovation Program (ABIP) and Agri-Opportunities Program**

The notice of intent suggests that the mandate's ultimate goal is to evolve beyond bio-fuels production to a sustainable, bio-based economy. To advance this goal, two federally funded programs have been developed to help make this leap possible.

Agricultural Bio-products Innovation Program (ABIP) is a 145 million dollar, multi-year program that seeks to mobilize research networks that conduct scientific research projects with a specific focus on developing effective and efficient technologies for an agricultural

biomass conversion; and product diversification through technologies such as agricultural and industrial chemicals, biomaterials and health products. A cap of 25 million per network has been established with an individual project receiving no more than 15 million.

The Agri-Opportunities Program is a 134 million dollar, five-year program that aims to accelerate the commercialization of new agricultural products, processes or services that are currently not produced or commercially available in Canada and that are ready to be delivered to the marketplace. The program is delivered nationally through AAFC and focuses on projects geared to new agri-food, agriculture or bio-products that are expected to increase market opportunities for the Canadian agricultural industry and that can generate a demand for primary agricultural products. The program provides a maximum repayable contribution of $10 million per project and recipient. The target contribution per project is 33% of total project costs. The program closes March 31, 2011.

**(iv) NextGen Biofuels Fund**

The Canadian government delivered a 500 million dollar grant over eight years to Sustainable Development Technology Canada. This NextGen Biofuels Fund is designed to address the gap between demonstration and commercialization by supporting the establishment of first-of-kind, large-scale facilities for the production of next generation fuel production facilities. This type of technology would help achieve the government's goal of nationalizing the mandate as non-food feed stocks from across Canada such as wheat straw, corn stover, wood residue and switch grass could be used in the production of bio-fuels. Municipal solid waste and forestry slash in Ontario and Quebec, straw from the Prairies, and mountain pine beetle-damaged wood in western Canada could be used in the production of celluosic ethanol. This also feeds into joint federal and provincial initiatives such as Forestry Innovation, ecoENERGY Technology Initiatives, and the afore-mentioned ABIP and Agri-Opportunities programs. In March of 2008, the Government of Canada announced that Iogen Corporation's application for funding through the NextGen Biofuels Fund to build Canada's first commercial-scale cellulosic ethanol plant had progressed to the due diligence phase. For more information, see the section on IOGEN.

Of note are the projects which are funded through a second $550 million dollar fund also managed by the Sustainable Development Technology. The $550 million SD Tech Fund™ is aimed at supporting the late-stage development and pre-commercial demonstration of clean technology solutions. Some of these projects can feed into the NextGen Biofuels Fund. In the latest round of funding announcements (round 11), one project in particular was related to renewable fuels. The lead organization for the project is Menova Energy Inc. and their goal is to develop and demonstrate the technical and commercial viability of using algae to sequester CO2 emissions and subsequently produce biodiesel. SDTC does not require any repayments of the financial contributions it provides to funded projects through the SD Tech Fund.

**E. Provincial Mandates and Programs to Encourage the Development of a Renewable Fuels Industry**

While provinces have led the way in terms of developing mandates on renewable fuel contents, inconsistencies in provincial requirements have frustrated the flow of bio-fuel trade within Canada. With each provincial government implementing its own complex and un-harmonized set of tax exemptions on ethanol and/or production incentives with varying amounts, eligibility and duration, the result is barriers to trade flows and the possibility of distorting the market for renewable fuel by encouraging production in areas where this activity is not well suited. Within the notice of intent, the federal government makes note of these barriers and sees the federal mandate as a means for it to work with provinces at

reducing the patchwork of provincial mandates that have resulted in inter-provincial trade barriers. However, the ability of the federal government to carry out this role is unclear as federal-provincial relations can be, at times, strained, and which can undermine federal authority, at least in the short term.

Some provinces have gone forward and implemented provincial mandates on the amount of ethanol required in the gasoline pool before the federal government committed to a mandate. Others held back until this year, waiting for the national mandate to be announced so that they could align themselves with the federal policy. Table 2.2 summarizes the incentive measures provinces that are currently in effect:

**Table 2.2**
**Provincial Mandates, Tax Exemptions, Incentives, and Conditions**

| Province / Mandate | Mandate | Incentives | Conditions / Duration |
|---|---|---|---|
| **Alberta** | No mandate | Renewable energy producer credit:<br><br>The producer credit amount is $0.09/L for production from plants with a capacity of 150 million liters or more a year.<br><br>For plants with capacity of less than 150 million liters per year, the credit amount is $0.14/L | Conditions: In order to be eligible for the renewable energy producer credit, the product must be produced at a facility located in Alberta.<br><br>Duration: The credit program runs from April 1, 2007 – March 31, 2011. |
| **British Columbia(BC)** | Intends to mandate a 5% renewable fuel content in the gasoline and diesel supply pools in 2010. | Excise Fuel Tax Exemption:<br><br>The ethanol and biodiesel portion of the motor fuel (use in internal combustion engine) is exempt from the provincial fuel tax and is also exempt from the province's new carbon tax. Biodiesel fuel used for non motor purposes (residential or commercial) is exempt from the provincial sales tax.<br><br>B.C. offers a full rebate (14.5 cents per | Conditions: As of July 1, 2004, the **ethanol portion**, including denaturant, of an ethanol/gasoline or gasoline/diesel blend is **exempt** from tax if the ethanol portion is not less than **5%** or more than **25%** of the volume of the blend.<br><br>Effective February 20, 2008, ethanol used as colored fuel, marine diesel, locomotive fuel, jet fuel or aviation fuel is exempt from tax. This includes the portion |

| | | | |
|---|---|---|---|
| | | liter) on E85 to E100 blends. | used in any biodiesel fuel blend and any ethanol blend in which the ethanol portion is from **5%** to **25%**. Previously, ethanol was only exempt from tax when used in motor vehicles on a highway.<br><br>Duration: No duration specified. |
| | | Carbon Tax Exemption<br><br>Ethanol and biodiesel are exempt under the Carbon Tax Act. | Duration: No duration specified |
| **Manitoba** | 5% pool average ethanol content in gasoline from January 1, 2008 – March 31, 2008;<br><br>8.5% pool average ethanol content beginning April 1, 2008 | Direct Payment Production Incentive<br><br>20 cents/liter producer incentive beginning January 1, 2008 until Dec 31, 2009.<br><br>15 cents/liter producer credit from January 1, 2010 -December 31, 2012<br><br>10 cents/litre from January 1, 2013 - December 31, 2015. | Condition: To be eligible for the credit, the ethanol has to be produced and sold in Manitoba.<br><br>The incentive is capped on an annual basis by the amount of ethanol required for the mandate.<br><br>Duration: January 1, 2008 – December 31, 2015. |
| | | Excise fuel tax exception for E10<br><br>2.5 cents per liter tax exemption on E10 blends. Provincial fuel tax rate is 11.5 cents per litre. | Conditions:<br>To be eligible for the provincial excise tax exemption, the ethanol blend must be E10 produced and sold within the jurisdiction.<br><br>Duration: No specific duration |
| **Ontario** | All gas sold must contain 5% ethanol, beginning in January 2007; | None | None |

| | | | |
|---|---|---|---|
| | Amount increase to 10% by 2010 (tentative) | | |
| **Quebec** | Intends to mandate 5% ethanol content in gasoline by 2012. | Tax Credit Refund<br><br>On April 21, 2005, the government announced a refundable tax credit, to be granted for a maximum of 10 years, to corporations that produce ethanol from renewable material and sell the ethanol for use in Québec. | Conditions:<br>To be eligible for the exemption, the ethanol must be produced and sold in Quebec<br><br>Additional conditions to be entitled to the credit is that the tax credit is limited to a maximum ethanol production credit of 126 million liters and *no tax credit is given for the month in which the average monthly price of crude oil is equal to or greater than US$65 a barrel or the total cumulative production of ethanol exceeds 1.2 billion liters*<br><br>Duration:<br>April 1, 2006 - March 18, 2018 |
| **Saskatchewan** | All gas sold must contain 7.5% ethanol, began mid-2006. | Ethanol Fuel Grant Program<br><br>Grants for eligible fuel distributors. | Conditions: The ethanol must be produced and consumed in Saskatchewan.<br><br>Duration:<br>No duration specified. |

(i) Alberta Bio-fuel Policies

Alberta has no provincial renewable fuel content mandate in place, but the province replaced its provincial fuel excise tax exemption on gasohol, ethanol, E-85 and biodiesel with a renewable energy producer credit program. Commercial producers of biofuel or biogas are eligible for the credit program. The credit amount is $0.09/L for production from plants with a capacity of 150 million liters or more per year. For plants with capacity of less than 150 million liters per year, the credit amount is $0.14/L. In order for to be eligible for the renewable energy producer credit, the product must be produced at a facility located in Alberta. The Renewable Energy Producer Credit Program is being administered by Alberta Energy and runs from April 1, 2007 to March 31, 2011. In addition, the producer credit may

be granted to commercial producers of biodiesel and syngas from agricultural or forest biomass, ethanol and methane from anaerobic processes. In October of 2006, Alberta approved 3 program initiatives from its nine-point bioenergy plan.

Approved program initiatives include:

- 24 million $Can through 2008-2009 for the development and commercialization of bio-fuels (capacity building); Commercialization/Market Development Program
- 6 million $Can through 2008-2009 for bio-energy infrastructure development grant program; Bioenergy Infrastructure Development Grant Program
- 209 million $Can from 2007-2011 for a renewable energy producer credit program; Renewable Energy Producer Credit Program

Other proposed policy initiatives in this plan include:

- Energy microgeneration standards and policy revisions
- Bio-industry network development
- Taxation and investment instruments for the bio-energy sector
- Working towards the national renewable standard and energy market targets
- Specified risk material disposal protocol
- Investment support through existing programs that align with Bioenergy Development.

(ii) British Columbia Bio-fuel Policies

In 2007/2008, the province of British Columbia (BC) became wholeheartedly committed to bioenergy and renewables and set an objective to lower greenhouse gases emissions by 33 percent by 2020. The province, under its Ministry of Energy, Mines and Petroleum Resources, unveiled 2 strategy documents/plans related to using bioenergy resources to fight climate change through the reduction of greenhouse gases. The first is the BC Energy Plan, unveiled late February 2007. This document sets out the necessary steps for reducing BC's greenhouse gas emissions and commits to investments in alternative technologies, including biofuels for transportation. The second is the BC Bioenergy Strategy which was made public at the end of January 2008. Part of this strategy includes:

- Establishing $25 million in funding for a provincial Bioenergy Network to encourage greater investment and innovation in B.C. bioenergy projects and technologies;
- Establishing funding to advance provincial biodiesel production with up to $10 million over three years; and,
- Issuing a two-part Bioenergy Call for Power, focusing on existing biomass inventory in the forest industry.

An important component of the BC Energy Plan includes the implementation of a 5% average renewable fuel standard for diesel (higher that the anticipated federal mandate of 2%), and supporting the federal action of increasing the ethanol content of gasoline to 5% by 2010. Industry sources explain that the reason for B.C.'s more aggressive stance on biodiesel is that the province has more experience producing biodiesel. B.C. currently does not have an industrial scale ethanol or biodiesel plant. Underpinning the commitment for a renewable fuels mandate for transportation fuels is the Greenhouse Gas Reduction (Renewable and Low Carbon Fuel Requirements) Act which received royal assent on May 1, 2008. The Act enables the government to set new requirements for transportation fuels. The goal of the Act is to reduce greenhouse gas emissions by reducing the impact of transportation fuels. The Act

will come into force once the regulations have been passed. The Renewable Fuel Regulations are expected to be passed in the fall of 2008.

The consumption incentives for ethanol and biodiesel are in the form of tax exemptions. B.C. has both a tiered motor fuel tax and a carbon tax. The Motor Fuel Tax Act sets out the exemptions for ethanol and biodiesel. Effective July 1, 2004, the ethanol portion, including denaturant, of an ethanol/gasoline or gasoline/diesel blend is exempt from tax if the ethanol portion is not less than 5% or more than 25% of the volume of the blend. Effective February 20, 2008, ethanol used as coloured fuel, marine diesel, locomotive fuel, jet fuel or aviation fuel is exempt from tax. This includes the portion used in any biodiesel fuel blend and any ethanol blend in which the ethanol portion is from 5% to 25%. Previously, ethanol was only exempt from tax when used in motor vehicles on a highway. Ethanol blends greater than 85% are 100% exempt.

Effective February 21, 2007, biodiesel is exempt from tax when used on-highway. This exemption includes the biodiesel portion of any blend of biodiesel and diesel fuel, as well as pure biodiesel (B100). Effective February 20, 2008, biodiesel used as coloured fuel, marine diesel, locomotive fuel, jet fuel or aviation fuel are exempt from tax. This includes the portion used in any biodiesel fuel blend and any ethanol blend in which the ethanol portion is from 5% to 25%. Previously, biodiesel was only exempt from tax when used in motor vehicles on a highway.
The Carbon Tax Act is the legislation that sets out the low carbon fuel requirement for a 10% reduction in carbon content of fuel by 2010. B.C.'s new carbon tax came into effect on July 1st, 2008. Under the Carbon Tax Act, the renewable fuel potions of blended motor fuel are exempt from taxation. It is expected that the low carbon requirement will increase the demand for biofuels.

Of note, B.C. does not have the feedstock necessary to make a substantive amount of grain-based ethanol production and therefore the federal and provincial grants aimed at ethanol production are going to cellulosic ethanol production technologies that are looking at how wood damaged by the pinewood beetle could be used as a feedstock. Also of note, British Columbia is also strongly supporting efforts to use hydrogen as a clean fuel source of fuel in the future and is working towards establishing a new harmonized regulatory framework for hydrogen by 2010 as part of the BC Energy Plan.

Below are links to B.C.'s biofuels strategy, legislation, and regulations:

BC Energy Plan
BC Bioenergy Strategy
Greenhouse Gas Reduction (Renewable and Low Carbon Fuel Requirements) Act
Motor Fuel Tax Act
Carbon Tax Act

(iii) Manitoba Bio-Fuel Policies

Manitoba is developing its ethanol industry under the Energy Development Initiative section of the Ministry of Science Technology Energy and Mines. Manitoba never implemented a mandate first brought in 2003 under the Bio-fuels and Gasoline Tax Act due to lack of production capacity. Earlier in the spring of 2007, amendments were proposed for the Act which would update it and align it with the federal and other provincial mandates/incentives. The implementation of The Bio-fuels and Gasoline Tax Amendment Act was then delayed due to a spring provincial election, but was finally enacted in the fall of 2007. The mandate requiring that 8.5% of the gasoline pool contain ethanol came into effect on January 1, 2008,

beginning with a 5% ethanol content requirement for the first quarter of the year and moving to 8.5% for the remainder of 2008 and subsequent years. The gasoline tax exemptions for ethanol have been replaced by a direct producer grant that decreases over a period of eight years. The staggered, decreasing production incentives are as follows: 20 cents/liter producer incentive beginning January 1, 2008 until December 31,2009; 15 cents/liter production incentive beginning January 1, 2010 until December 31, 2012; 10 cents/liter producer incentive beginning January 1, 2013 until December 31, 2015. To be eligible for the incentive, ethanol must be produced in Manitoba and sold in Manitoba to fuel suppliers. More information on Manitoba's ethanol initiative is available on the Manitoba Ethanol Energy Office website.

Below are links to Manitoba's biofuels legislation and regulations:

The Biofuels Act
Ethanol General Regulation
Ethanol Fund Grant Regulation

(iii) Saskatchewan Bio-fuel Policies

Saskatchewan was an early leader in ethanol production and currently has a 7.5% ethanol content requirement in its gasoline. The Saskatchewan Ministry of Enterprise and Innovation originally administered the Saskatchewan Ethanol Program, but provincial government sources stated that it will be turned over to the Ministry of Agriculture. In June 2007, the government of Saskatchewan committed 80 million dollars to the development of bio-fuel production facilities under the Saskatchewan Biofuels Investment Opportunity Program (SaskBIO). It is a four-year provincial program that provides repayable contributions of up to $10 million dollars per project. This program is currently being administered by the Ministry of Enterprise and Innovation. Funding contributions will vary according to plant capacity, costs, and community-farmer investment. An additional $2 million will also be provided for bio-fuels and bio-products research and development. Saskatchewan does not provide fuel tax exemptions for alternative fuels but does provide grants to fuel distributors through the Ethanol Fuel Grants Program. To be eligible for the grants, the ethanol used by the distributor has to have been produced at a facility located in Saskatchewan from biomass grown in Saskatchewan.

Saskatchewan is also going forward with its "Go Green" strategy. A key part of the strategy is the promotion of more environmentally friendly transportation. Initiatives include working with industry to develop E-85 (fuel blends with 85% ethanol and 15% gasoline) corridors in the province, developing a 1.4 billion liter bio-fuels industry in Saskatchewan, and implementing a Government and Crown vehicle purchase policy that requires all vehicles to be hybrid electric, alternative or flex-fuel, or within the top 20 per cent efficiency in their class.

Below are links that provide additional information on the legislation underpinning Saskatchewan's bio-fuel goals:

**Saskatchewan Ethanol Fuel Act**
**Saskatchewan Ethanol Fuel General Regulations**
**Saskatchewan Ethanol Fuel (Grants) Regulations**

(iv) Ontario Bio-fuel Policies

Ontario is the largest ethanol-producing province in Canada and has been a leader in building ethanol production capacity in Canada. Its ethanol strategy has two components; (1) a renewable fuel standard mandate, and (2) the Ontario Ethanol Growth Fund (OEGF) that was created in 2005. As of January 1, 2007, the gasoline tax exemption of 14.7¢ a liter on the ethanol portion of the ethanol-blended gasoline was no longer in effect. At the same time, a mandate that requires an average of 5% ethanol be blended in the gasoline sold in Ontario came into effect. The OEGF provides:

- 32.5 million $CAN for capital assistance to help meet financial challenges; cannot exceed 10¢ per liter
- 60.5 million per year $CAN from 2007-2017 for operating assistance to address changing market prices; no operating grant will exceed 11¢ per liter of ethanol
- 16 million $CAN in support of independent retailers selling ethanol blends; Independent Gasoline Blender's Transition Fund,
- 7.5 million $CAN in private and public funds for research and development opportunities

(v) Quebec Bio-Fuel Policies

Quebec currently has no mandate in place for renewable fuel content in gasoline. The provincial government has announced its intention to mandate 5% bio-fuel content in its gasoline pool by 2012. Quebec currently has in place a temporary refundable tax credit (maximum $0.185 per litre), to be granted for a maximum of 10 years, to corporations that produce ethanol from renewable material and sell the ethanol for use in Québec. It began April, 2006 and expires in 2018. An eligible corporation's ethanol production must be sold in Quebec to a person holding a collection officer's permit issued under The Fuel Tax Act. Additional conditions to be entitled to the credit is that the tax credit is limited to a maximum ethanol production credit of 126 million litres and *no tax credit is given for the month in which the average monthly price of crude oil is equal to or greater than US$65 or the total cumulative production of ethanol exceeds 1.2 billion litres.* The reasoning for this limitation is that it was assumed that ethanol would be competitive with gasoline is the price of crude oil exceed 65$US a barrel. More information is available on the web site of Revenue Quebec.

While some corn production takes place in Quebec, Quebec's focus is on the development of cellulosic ethanol. It is Quebec's intention to use wood from its forestry industry to grow its ethanol market. This technology seems to be moving closer to commercialization given the recent joint venture announcement between Enerkem, a Quebec-based gasification and catalysis technology company, and Greenfield Ethanol, Canada's leading ethanol producer. See the section on Fuels Produced from Other Biomass for more information. More information on Québec's ethanol initiative is available on the following website: http://www.mrnf.gouv.qc.ca/english/energy/sources/sources-biomass.jsp

(vi) Biofuel Policies in Atlantic Canada

In 2008, there has been growing interest in the possibility of developing a biofuels sector in eastern Canada. The biofuels sector has struggled to establish a presence in the Maritime Provinces due to a lack of provincial government support and a lack of biofuel initiatives. This year, several Atlantic provincial governments have begun looking over their energy strategies and are struggling to evaluate the feasibility of a renewable energy industry for

their respective provinces. For example, in the spring of 2008, Prince Edward Island made public its "discussion paper" on energy strategy and then held public consultations across the province to get Islanders' feedback. The final report will be tabled in the summer. The province of New Brunswick is also is currently conducting an assessment of the alternative fuels industry in New Brunswick. Based on the result of that assessment, a policy framework on biofuels will be established. Legislation is also being reviewed to ensure that the proper taxation authority is in place and to ensure that there is flexibility to provide for varying tax rates (tax exemptions) depending on emerging tax policy. The province of New Brunswick currently has no mandate in place for renewable fuel content in gasoline or diesel. In fact, in order to control the misuse of gasoline, methanol and ethanol blends are illegal in New Brunswick. However, with ethanol and bio-diesel beginning to emerge in NB as commercially viable alternatives to conventional types of fuel and the government, this will likely change.

The federal government has also encouraged the development of a biofuels industry in Atlantic Canada. In early 2008, the federal government announced $860,000 in funding for three biofuels/biodiesel projects in New Brunswick. Half a million dollars was awarded to BIO-D Energie Inc to purchase and retrofit an existing facility in order to establish a biodiesel processing plant facility in the community of Clair. The monies come out of the Atlantic Canada's Opportunities Agency's (ACOA) Business Development Program. BIO D Energie Inc was also granted C$300,000 under Agriculture and Agri-Food Canada's (AAFC) Biofuels Opportunities for Producers Initiative (BOPI) to refine their production technology in order to produce biodiesel from canola and soy to meet North American standards. The Center for Excellence in Agriculture and Biotechnological Sciences in Grand Falls was been awarded C$61,000 through Agriculture and Agri-Food Canada's Advancing Canadian Agriculture and Agri-Food (ACAAF) program to determine the most cost-efficient technology to transform starch from waste potatoes and grain into lactic acid that can be used in biodegradable plastic and other more environmentally-friendly packaging.

## 3. Energy Markets

### A. Energy Production and Consumption Patterns

Unlike the United States, energy security is not a factor behind the recent and projected growth in Canada's ethanol industry. Canada has the world's second largest proven oil reserves (estimated at 179.2 billion barrels) and is one of the top 10 oil-exporting countries in the world. According to the National Energy Board of Canada (NEB), in 2007, Canadian production of crude oil and equivalent averaged 2.775 million barrels (US liquid) per day, and represents a 6% increase over 2006 levels of 2.620 million barrels per day. The NEB attributes this increase to growing oil sands production from both in situ and surface-mining projects, and to the 16% increase production off Canada's eastern coast due to improvements in operational performances at the Terra Nova and White Rose fields compared with the previous year. The NEB expects a 2% increase in crude oil production in 2008.

Table 3.1 provides a quick overview of Canadian oil production and consumption patterns from 2001 – 2007.

**Table 3.1**
**Growth in Canadian Oil Production, Consumption and Net Exports*, 2000-2007; in '000 barrels per day**

| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|---|---|
| **Total Oil Production[1]** | 2,813 | 2,950 | 3,110 | 3,135 | 3,092 | 3,288 | 3,356 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **% change** | | 5% | 5% | 1% | -1% | 6% | 2% |
| **Total growth (2001-2007)** | | | | | | | 19% |
| **Crude Oil Production[2]** | 2,029 | 2,171 | 2,306 | 2,398 | 2,369 | 2,525 | 2,609 |
| **% change** | | 7% | 6% | 4% | -1% | 7% | 3% |
| **Total growth (2001-2007)** | | | | | | | 29% |
| **Canadian Consumption[3]** | 2,057 | 2,078 | 2,207 | 2,300 | 2297 | 2,264 | 2,340 |
| **% change** | | 1% | 6% | 4% | 0% | -1% | 3% |
| **Total growth (2001-2007)** | | | | | | | 14% |
| **Net Exports of Petroleum** | 756 | 871 | 903 | 836 | 795 | 1024 | 1,016 |
| **% change** | | 15% | 4% | -7% | -5% | 29% | 0% |
| **Total growth (2001-2007)** | | | | | | | 26% |

*expressed in liquid(l) barrels

Source: Energy Information Agency, US Dept. of Energy

[1] total oil production includes lease condensate, natural gas liquid, and other liquids, and refinery processing gain (loss). Negative values indicates refinery processing loss

[2] includes lease condensate

[3] consumption of petroleum products and direct combustion of crude oil

**B. Energy Demand by the Transportation Sector**

While Canada is a significant producer of oil, it also ranks among the world top 10 consumers of petroleum. As illustrated in table 3.2 on the following page, transportation, on average, accounts for about 22% of total energy demand. Of that share, motor gasoline and diesel fuel oil account for 87% of the energy used (see table 3.4 on following page). Based on data from the US Department of Energy, Canada increased its consumption of petroleum in 2007 (see table 3.1), and this increase in consumption was reflected in an increase in energy consumption in the transportation industry. In 2007, according to the NEB, demand by the transportation industry decreased by 3 percent over 2006 levels (see table 3.2). The decrease in demand is attributed to a variety of factors including growth in Canada's agriculture, mining and energy sectors.

**Table 3.2**
**Domestic Energy Consumption; in petajoules**

| | 2003 | 2004 | 2005 | 2006[(a)] | 2007[(a)] | 06/07 |
|---|---|---|---|---|---|---|
| **Residential[(b)]** | 1,448 | 1,425 | 1,410 | 1,369 | 1,442 | 0.05 |
| **Commercial** | 1,444 | 1,459 | 1,363 | 1,300 | 1,347 | 0.04 |
| **Industrial[(b)(c)]** | 4,704 | 4,853 | 5,203 | 5,252 | 5,323 | 0.01 |
| **Transportation** | 2,577 | 2,679 | 2,777 | 2,758 | 2,864 | 0.04 |
| **Total** | 10,173 | 10,416 | 10,753 | 10,679 | 10,976 | 0.03 |

(a) includes consumption of imported energy

Source: National Energy Board

A closer look at the use of energy within the transportation industry shows that on average, for the last seven years, the share of energy used for freight averages 41% per year and the share of energy used for passenger transportation averages 54%.

**Table 3.3**
**Energy Use by Transportation Sector; in petajoules**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006(e) |
|---|---|---|---|---|---|---|---|
| **Total Energy Use** | 2,282 | 2,277 | 2,306 | 2,362 | 2,465 | 2502 | 2,357 |
| **Freight** | 947 | 933 | 938 | 977 | 1,035 | 1,028 | 966 |
| **Passenger** | 1,255 | 1,256 | 1,276 | 1,292 | 1,334 | 1,376 | 1,249 |
| **Off road** | 80 | 89 | 92 | 93 | 96 | 97 | 94 |
| **Shares (%)** | **2000** | **2001** | **2002** | **2003** | **2004** | **2005** | **2006** |
| **Freight** | 42% | 41% | 41% | 41% | 42% | 41% | 41% |
| **Passenger** | 55% | 55% | 55% | 55% | 54% | 55% | 53% |
| **Off road** | 4% | 4% | 4% | 4% | 4% | 4% | 4% |

* year 2006 are estimates; most recent data available
Source: Office of Energy

A breakdown of transportation energy use by fuel type reveals that gasoline and diesel fuel account for an average of 58% and 30%, respectively, of the fuel type used, and dominate as the transportation sector's main energy sources (see table 3.4).

**Table 3.4**
**Transportation Sector Energy Use by Source; in petajoules**

| | 2001 | 2002 | 2003 | 2004 | 2005 |
|---|---|---|---|---|---|
| **Total Energy Use** | 2,277 | 2,306 | 2,362 | 2,465 | 2,502 |
| **Electricity** | 3 | 3 | 3 | 4 | 4 |
| **Natural Gas** | 2 | 2 | 2 | 2 | 2 |
| **Motor Gasoline** | 1,309 | 1,333 | 1,335 | 1,384 | 1,378 |
| **Diesel Fuel Oil** | 650 | 662 | 698 | 745 | 782 |
| **Light Fuel Oil and Kerosene** | 0 | 0 | 0 | 0 | 0 |
| **Heavy Fuel Oil** | 78 | 65 | 67 | 69 | 68 |
| **Aviation Gasoline** | 4 | 4 | 3 | 3 | 3 |
| **Aviation Turbo Fuel** | 215 | 225 | 223 | 246 | 256 |
| **Propane** | 17 | 12 | 12 | 13 | 10 |
| **Coal** | 0 | 0 | 0 | 0 | 0 |
| **Shares(%)** | **2001** | **2002** | **2003** | **2004** | **2005** |
| **Electricity** | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| **Natural Gas** | 0.1% | 0.1% | 0.1% | 0.1% | 0.1% |
| **Motor Gasoline** | 57.5% | 57.8% | 56.5% | 56.2% | 55.1% |
| **Diesel Fuel Oil** | 28.6% | 28.7% | 29.5% | 30.2% | 31.2% |
| **Light Fuel Oil and Kerosene** | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **Heavy Fuel Oil** | 3.4% | 2.8% | 2.8% | 2.8% | 2.7% |
| **Aviation Gasoline** | 0.2% | 0.2% | 0.1% | 0.1% | 0.1% |
| **Aviation Turbo Fuel** | 9.4% | 9.7% | 9.4% | 10.0% | 10.2% |
| **Propane** | 0.7% | 0.5% | 0.5% | 0.5% | 0.4% |

* year 2005 is the latest year for which data was available
Source: Office of Energy

### C. Imports and Exports

The Canadian NEB estimates total crude oil exports at 1.852 million barrels (US liquid) per day, in 2007, an increase of 3% from 2006 levels of 1.795 million barrels per day (US liquid). According to the Energy Information Administration (EIA), Canada remained the largest export country to the U.S. for crude oil in 2007, ahead of both Saudi Arabia and Mexico.

Despite Canada's position as a net exporter of crude oil, much of the requirements of eastern refineries are met with foreign produced crude oil. In 2007, the NEB reported that crude oil imports increased from 2006 levels by 6% to 909 thousand barrels (US liquid) per day, which represents 48% of total refinery feedstock requirements in Canada. Canadian oil production is unevenly distributed across Canada and results in Canada's eastern provinces, where most of the population is located, being net importers. Due to better transportation networks, imports, more than 1/3 of which originate from the United Kingdom and Norway, help meet the requirements for the Atlantic region and Quebec. According to the NEB, the province of Quebec was the largest regional importer of crude oil with 92% of their refining needs being supplied from international sources.

Canada remains a net exporter of main petroleum products including middle distillate (heating oil, jet fuel and diesel fuel), heavy fuel oil and gasoline. In 2007, exports of main petroleum products and partially processed oil are estimated at 449 thousand barrels (US liquid) per day, a 6% increase compared with 2006 export levels. This increase is attributed to a decrease in refinery production in the United States, combined with an increase in product availability in Canada. The NEB estimates that imports of main petroleum products in 2007 stood at 271 thousand barrels (US liquid) per day, a seven percent decrease from 2006 levels. This decrease is attributed to an increase in domestic supply.

## 4. The Canadian Ethanol Industry

### A. Ethanol Production and Distribution Capacities

Based on the trend of net sales of gasoline used for road motor vehicles over the past 5 years (see table 4.1 below), a federal mandate of 5% renewable fuel content would require a minimum of 1.9 billion liters.

**Table 4.1**

**Sales of Fuel Used for Road Motor Vehicles, Canada; in '000 liters**

| | 2002 | 2003 | 2004 | 2005 | 2006 | Average | 05/06 |
|---|---|---|---|---|---|---|---|
| **Net sales of gasoline** | 37,949,600 | 38,421,608 | 38,908,671 | 38,424,100 | 38,416,021 | 38,424,000 | -0.02% |
| **Net sales of diesel oil** | 13,737,648 | 14,720,634 | 15,671,144 | 16,216,420 | 16,594,616 | 15,388,092 | 2.33% |

Source: Statistics Canada; 2006 year for which most recent data is available

**Table 4.2**
**Fuel Ethanol Production Plant - Existing, Expanding, Under Construction**

| Status | Location | Company Name | Primary Feedstock | Expected Capacity (million liters) |
|---|---|---|---|---|
| existing | Varennes Quebec | Greenfield Ethanol* | corn | 120 |
| existing | Chatham, Ontario | Greenfield Ethanol^ | corn | 150 |
| existing | Ottawa, Ontario | Iogen | Wheat straw | 2 |
| existing | St Clair, Ontario | Suncor Energy* | corn | 200 |
| existing | Tiverton, Ontario | Greenfield Ethanol | corn | 26 |
| existing | Minnedosa, Manitoba | Husky Energy | wheat, corn | 130 |
| existing | Lloydminster, Saskatchewan | Husky Energy* | wheat | 130 |
| existing | Weyburn, Saskatchewan | NorAmera Bioenergy* | wheat | 25 |
| existing | Lanigan Saskatchewan | Poundmaker | wheat | 12 |
| existing | Red Deer, Alberta | Permolex | wheat | 40 |
| existing | Belle Plaine, Saskatchewan | Terra Grain Fuels | wheat | *150* |
| existing | Aylmer, Ontario | IGPC^ | corn | *150* |
| *Under construction* | Unity, Saskatchewan | North West Bio Energy | wheat | ***25*** |
| *Under construction* | St-Clair, Ontario | Suncor | corn | ***200*** |
| *Under construction* | Collingwood, Ontario | Collingwood Ethanol^ | corn | ***50*** |
| *Under construction* | Johnstown, Ontario | Greenfield Ethanol* | corn | ***200*** |
| *Under construction* | Hensall, Ontario | Greenfield Ethanol^ | corn | ***200*** |
| * EEP recipients; ^ OEGF Funded projects | | | total: | **1,810** |

Source: Canadian Renewable Fuels Association

Should the projects under construction be realized, Canadian production is expected to reach 1.810 billion liters by the end of 2009, a production capacity that comes close to reaching the government of Canada's target of 1.9 billion litres by 2010. Current production capacity by the end of 2008 is estimated to reach 1.135 billion litres, doubling the previous year's estimated production capacity of 700 million litres. This increase is mainly the result of Husky Energy's plant in Minnedosa, Manitoba, completing its expansion, as well the Terra Grains Fuels and the IGPC ethanol plants coming on-line in the summer of 2008. Corn derived ethanol is produced in Quebec and Ontario and currently accounts for 60% of the domestic ethanol being produced. Ontario alone accounts for 42% of current domestic ethanol production. The remaining balance is wheat based ethanol which is produced by the Western provinces of Manitoba, Saskatchewan, and Alberta. The province of Saskatchewan accounts for 20% of current domestic ethanol production. The provinces of Ontario and Saskatchewan have been the leaders in promoting the merits of both provincial and federal renewable fuel mandates.

**B. Canadian Ethanol Production Business Models**

While the federal and provincial programs have been designed to encourage ethanol plants with greater agricultural producer/rural community equity or investment, Canadian ethanol production is being done by companies that range from energy companies and energy marketers, to companies which focus on grain-based ethanol production that often have some degree of producer equity/investment, to co-operatives, to companies focused on a range of activities such as grains, or other sources of renewable fuels. Only one multinational corporation, ADM, has involved itself in the production of Canadian ethanol. ADM has invested in Husky's large wheat-based ethanol production facility in Lloydminster,

Saskatchewan. To date, multinationals have not expressed interest in Canadian produced ethanol, seeing Canada primarily as a market for US–produced ethanol. This may change now that the Canadian government has unveiled its new programs and production incentives.

(i) Energy Producer and Marketers

**Husky and Suncor**

Husky and Suncor are two energy producers and marketing companies which have invested in ethanol production.

Husky is a Canadian-based integrated energy and energy related company that operates in the western provinces and off-shore on Canada's east coat. Husky is a pioneer in the production and marketing of ethanol-blended fuel. Husky completed construction on a new 130 million liter capacity facility on the pre-existing Minnedosa site in December of 2008. In the press release announcing its official opening in April 2008, the new facility was billed as one of the largest plants of its size and that at peak production it will produce 130 million litres of ethanol and 126,000 tonnes of dried distillers' grain with solubles annually. Husky markets its ethanol blended fuel under the name "Mother Nature's Fuel" at Husky and Mohawk retail outlets.

More on Husky Energy is available on their website.

Suncor, best known for having pioneered commercial development of the oil sands in Alberta, has diversified and become a major North American energy producer and marketer. It opened its St Clair, Ontario plant in July 2006 and blends the ethanol produced into its Sunoco branded gasoline. In June of 2008, Suncor issued a press release announcing plans to proceed with a $120 million expansion of its St. Clair plant. In July of 2008, the government of Canada announced that Suncor would be receiving a $25 million grant through the ecoABC program. The ecoABC Program allows new ethanol plants to receive long-term, non-interest bearing contribution that are repayable once the plant earns a gross income of more than $0.20/litre. In addition to the grant, and as a requirement to be eligible for the grant, Suncor also received equity investment from farmers totaling $12.5 million for the project. This expansion will double current production capacity by increasing production to 400,000 liters per day as well as produce dried distillers grains with solubles and carbon dioxide. The target completion date is 2009.

More on Suncor is available on their website.

(ii) Grain Based Ethanol Plants with Producer Equity

**GreenField Ethanol**

Many of the Canadian ethanol plants have some producer equity due in large part to government programs that require a percentage of producer investment in order to be eligible for federal funding. GreenField Ethanol's (formerly known as Commercial Alcohols) first plant was in Chatham, Ontario and was started by a group of local producers who still have an equity position in GreenField.

GreenField Ethanol currently has three plants in operation that are capable of producing fuel-grade and beverage ethanol. The Tiverton, Ontario plant has a batch system manufacturing process and has a production capacity of 26 million litres of ethanol annually. The plant in Chatham, Ontario is currently the largest ethanol facility in Canada, producing 150 million liters of fuel ethanol per year in addition to a range of ethanol products including fuel-grade

and beverage alcohol. There is also a plant located in Varennes Quebec with an operating capacity of 120 million litres of ethanol. In addition to producing fuel grade ethanol, the plant will produce carbon dioxide (CO2) and Dried Distillers Grain (DDGs).

GreenField Ethanol plans is moving ahead with plans to extend producer investment opportunities to Hensall District Co-op, one of Canada's largest agricultural co-ooperative, to invest in its Hensall fuel-ethanol project. It also welcomes Seaway Valley Co-operative investors of the failed Cornwall project to invest in the Johnston project. Plants under construction in Johnston and Hensall, Ontario are expected to be in operation in 2009, a year later than originally announced. Both future plants will have a production capacity of 200 million litres and produce fuel-grade ethanol, $CO_2$ and DDGs.

GreenField Ethanol also announced a joint venture with Enerkem to develop cellulosic ethanol. See made a series of announcements concerning its investments in "next generation" biofuels. For more information see the Fuels Produced from Other Biomass section of this document.

GreenField ethanol and Monsanto teamed up in the fall of 2007 to launch the "Gro-Ethanol Program." The program offers incentives for Ontario corn producers to purchase and grow seeds with Monsanto traits and then sell this corn specifically into the ethanol market through GreenField Ethanol. The corn hybrids eligible for the program include Monsanto traits that produce higher yielding corn.

More on GreenField Ethanol is available on their website.

**Pound-maker**

Pound-maker began in the 1970's as a feedlot by local area farmers looking for alternative markets for their grain. A 10,000 head feedlot and a 10 million-liter ethanol plant were constructed in 1991, making it Canada's first integrated ethanol plant/feedlot. Ethanol production has increased to 12 million liters with technological improvements. The plants by-products are thin stillage and wet distillers' grains, both of which are used in the feedlot.

More information on Pound-maker is available on their website.

**Terra Grains**

Terra Grains is a privately held company with a number of Saskatchewan producers among the investors. It is a subsidiary of Universal Energy Group Limited. Plans for the 150 million litre ethanol plant to be built in Belle Plaine, Saskatchewan were first announced in 2006 with a target completion date of December of 2007. The plant is scheduled to begin production in August of 2008. The plant will use approximately 15 million bushels of wheat annually, produce 150 million liters of ethanol, and 165,000 tons of DDGs.

More on Terra Grains is available on their website.

**IGPC (Intergated Grain Processors Co-operative)**

IGPC, an 840 farmer and community member co-operative, began construction in June 2007 after being granted a 100-million dollar loan package. The community-owned ethanol plant is the largest start-up co-operative venture ever attempted in Canada. IGPC put 70 million $CAN of equity into the project and was granted 11.9 million $CAN in support from the federal Ethanol Expansion Program, and a 14 million $CAN capital grant from the Ontario Ethanol Growth Fund. IGPC was also awarded and additional $3.9 million in federal ecoABC

funding in March of 2008. The ecoABC Program allows new ethanol plants to receive long-term, non-interest bearing contribution that are repayable once the plant earns a gross income of more than $0.20/litre. Production is slatted to begin summer 2008.

More on IGPC is available on their website.

(iii) Renewable Energy Companies

**NorAmera**

NorAmera BioEnergy Corporation (NABEC) is a privately held company founded to produce renewable energy, and is considered a small player relative to other major ethanol production companies in Canada. Located in Weyburn, Saskatchewan, NorAmera converted a long-defunct Weyburn distillery into a state-of-the-art ethanol plant valued in excess of 20 million $CAN. The plant produces 25 million liters of ethanol a year and 23 thousand tones of DDGs.

More on NorAmera Bioenergy can be found on their website.

**Permolex**

Permolex International is an emerging global leader in the production of ethanol and other bio-fuel products from multiple feedstock. Its plant in Red Deer, Alberta was the first of its kind in North America using feed-grade wheat in its initial stages of production. The plant integrates three traditionally independent manufacturing processes – a flour mill, a gluten plant, and an ethanol plant and as a result is one of the largest users of the Canadian Prairie Spring (CPS) wheat variety in Canada. The CPS wheat is sold to Permolex either through the CWB or at spot market prices. The fuel ethanol plant uses the wet mill process.

**Iogen**

Based in Ottawa, Ontario, Iogen is a biotechnology firm that has pioneered the world's first demonstration-scale facility to convert cellulose material such as wheat straw into bio-ethanol using its patented enzymes manufactured in an adjacent enzyme manufacturing facility. Iogen currently has a small, cellulosic-ethanol demonstration plant in Ottawa with a production capacity of 2 million liters of ethanol a year. Iogen calls its product EcoEthanol. Although Iogen has received some public funding, until now, most of its financial backing comes from private companies. Much of its ethanol research is funded through the sale of its industrial-use enzymes. Iogen has long had plans to build several full-scale commercial plants, but has been in need of a government entity as a loan guarantor.

In March of 2008, the Government of Canada announced that Iogen Corporation's application for funding through the NextGen Biofuels Fund to build Canada's first commercial-scale cellulosic ethanol plant had progressed to the due diligence phase. Sustainable Development Technology Canada (SDTC), which manages the 500 million dollar fund, is expected to make a final decision shortly. Should approval for the project be confirmed, construction of Canada's first commercial-scale cellulosic ethanol production facility will begin in 2009, with ethanol production beginning in 2011. Iogen representatives stated that the $500-million, commercial-scale, cellulosic ethanol plant would also have a bio-refinery and produce steam, electricity, enzymes, fertilizers and value-added sugars. The plant would require 750 tonnes of wheat straw a day, which is why the plant will likely be built in Saskatchewan. If the funding for the project is approved, the funding is repaid based on free cash flow over a period of 10 years after project completion.

In mid-July, 2008, Royal Dutch Shell ("Shell") and its subsidiaries and Iogen Corporation announced an extended commercial alliance to accelerate development and deployment of cellulosic ethanol. Shell plans to invest significantly in the technology development of Iogen's cellulosic ethanol. Shell currently has a share holding of 26.3% in Iogen Energy Corporation. This new arrangement will increase Shell's shareholdings to 50%.

More on Iogen can be found on their website.

## 5. The Canadian Bio-diesel Industry

### A. Bio-diesel Production and Distribution Capacities

Based on the trend of diesel fuel sales in the last three years, a federal mandate of 2% renewable fuel content in diesel fuel would require a five-fold increase in current production capacity. Canada consumes approximately 26 billion liters of diesel fuel a year and the demand for diesel fuel is expected to increase and even outpace that of other fuels. There are three main reasons for this. A growing number of diesel-powered vehicles are required by the growing Canadian agriculture, mining and energy sectors. Fuel efficiency standards being imposed on vehicle manufacturer by governments are also contributing to increased demand for diesel as automobile companies have indicated that they will be introducing more diesel-powered vehicles to adhere to the regulations. Despite being higher priced, diesel fuel is also growing in demand as retail consumers start to take notice of the efficiency and durability of diesel engines.

The 2% mandate would require 520 million liters of bio-diesel. While Canada's bio-diesel production has not grown in the past year, there are more companies signaling their intent to build plants to meet the mandate. The most significant production capacity expansion development is the Canadian Bioenergy plant under construction in Sturgeon, Alberta. This plant, when working at full production, could meet 40% of the anticipated biodiesel mandate requirement. Future growth, however, may be limited the industry's ability to secure cheap feedstock. Most of the current and forecasted increase in bio-diesel comes from rendered animal by-products and industry sources put a ceiling on potential production from rendered animal fats at 250 million liters. High prices for oilseeds and limited crushing capacity in Canada may hinder Canada's ability to supply the majority of the feedstock necessary for the balance of the volume required. Crush capacity has increased with James Richard International and Louis Dreyfus Canada announcing the construction of large-scale crushing facilities.

The federal government's new bio-fuel strategies programs are geared more towards ethanol and are therefore limited in their ability to address the limiting factors for bio-diesel market growth. For example, crushing plants can be used to produce oil for both bio-diesel production and human consumption, but the federal government does not want to inadvertently subsidize crushing capacity for oils destined for human consumption. Many investors, seeing the potential for bio-diesel, hope to cash in on the federal government's ecoABC Initiative, a program to assist in the construction of bio-fuel facilities that have a minimum of five percent producer investment. The Saskatchewan Bio-diesel Development Council raised a red flag when it warned bio-diesel proponents that crushing components of bio-diesel ventures would not be eligible for the repayable contributions. The Saskatchewan Bio-diesel Development Council is frustrated by this, arguing that this violates the equity in support that is supposed to exist between ethanol and bio-diesel.

**Table 5.1**
**Bio-diesel Production Plants (Current, Expanding, Under Construction)**

| Status | Location | Company Name | Feedstock | Capacity (million liters) |
|---|---|---|---|---|
| Existing | Foam Lake, Saskatchewan | Milligan Bio-tech | canola oil | 1 |
| Existing | Montreal, Quebec | Rothsay | tallow | 30 |
| Existing | Hamilton, Ontario | BIOX Corporation | tallow, yellow grease, palm oil | 66 |
| Under construction | Sturgeon, Alberta | Canadian Bioenergy | Canola | 225 |
| | | | sum: | 322 |

Source: Canadian Renewable Fuels Association

## B. Canadian Bio-diesel Production Business Models

### Milligan Biotech

Milligan Bio-Tech was started by a small group of entrepreneurs working in conjunction with the local Marketing Club, the Saskatchewan Canola Development Commission, Agriculture Canada, the University of Saskatchewan and Saskatchewan Growers Association. The company is largely research and development focused. The original purpose was to develop and demonstrate how canola could be used to make the highest quality of bio-diesel. A series of pilot projects have been conducted to test the efficiency of canola-based bio-diesel (for example Saskatoon Transit's Bio-Bus project). In 2006, a crushing plant to generate the oil used for the production of bio-diesel and co-products was constructed in Foam Lake.

More information is available on the Milligan Biotech website.

### Rothsay

Rothsay is a division of Maple Leaf Foods Incorporated, a meat company. In late 2005, it opened its first commercial–scale bio-diesel plant. The facility has a commercial capacity of 35 million liters annually. Maple Leaf, through Rothsay, has been working to foster the bio-diesel industry in Canada and has been involved in pilot projects designed to test the efficiency of bio-diesel such as the city of Montreal's Bio-Bus and BioMer.

More information is available on the Rothsay website.

### BIOX Corporation

Biox is a multinational that was incorporated in Canada in 2001. Its goals are global and it structures partnerships with both companies and individuals. Its goal is to produce ASTM D6751-07 and EN 14214 grade bio-diesel from a variety of feedstocks such as vegetable oils, agricultural seed oils/greases or waste from animals fats. Its 1 million liter pilot plant was opened in Oakville, Ontario. In late 2006, BIOX completed construction and commission of its first commercial-scale bio-diesel demonstration facility that produces 60 million liters per year.

More information is available on the BIOX Corporation website.

**Canadian Bioenergy**

Canadian Bioenergy is Canada's leading integrated biodiesel company. In October of 2007, the company announced plans to build a biodiesel refinery in Sturgeon, Alberta that would produce 225 million litres of canola-based biodiesel. The land on which the plant is being built is adjacent to a canola-crushing plant owned by Bunge. A company representative stated that the plant, when operating at full capacity, would consume 5% of Canada's canola crop. Rising canola prices remain a concern for the company, but the company feels confident that the project will be successful. The plant's 225 million litres per year of canola based biodiesel would represent over 40% of the 520 million litres of bios-deisel the government of Canada estimates would be required to meet a 2% biodiesel mandate in 2010.

More information is available on the Canadian Bioenergy Corporation website.

## 6. Import Regimes for Bio-Fuels

There is no tariff on renewable fuels produced in the United States and imported into Canada, however, Canada does have a tariff on ethanol imported from Brazil ($0.05 per liter).

While the current differences in provincial tax exemptions do not greatly affect production decisions, the unlikely combination of lower oil prices (should we return to pre-2005 levels), and higher grain prices could make certain provincial tax-exemption restrictions obstacles to expanding the industry.

## 7. The Economics of Bio-fuel Production in Canada

The long-term viability of producing bio-fuels in Canada will depend on a multitude of factors including size, production types, co-products, feedstock costs, and energy prices. The required increase in bio-fuel production set out by the federal mandate will necessitate a build up of infrastructure to support the industry. The new demand driver for grains from the renewable fuel industry world-wide has intensified the competition between grains for industrial use and for feed and food usages. This is having a significant impact on agriculture as the increase in demand for grains has lead to increases in grain prices, land values, and input costs such as fertilizer and herbicides.

### A. Factors Affecting the Long-term Viability of a Canadian Bio-fuel Industry

A multitude of studies have been conducted on the cost of production for different plant sizes for ethanol production. Economic studies conducted in the US have shown that there are large economies of scale in bio-fuel manufacturing. It was estimated that tripling of a plant size reduced capital costs by 40% and operating costs by 15-20%. All new Canadian ethanol plants under construction, with the exception of Collingwood Ethanol and North West Bio Energy, are all large-scale facilities designed to capture these economies of scale. The eligibility limits outlined by the federal government production program is 200 million liters per year, production limits that Canadian plants currently are below.

While ethanol tends to follow the trends of petroleum prices, ethanol is not a primary energy source. It requires energy to make this type of energy and many critics maintain that it takes more energy to produce ethanol than is derived from ethanol. The total effect of

ethanol as a gasoline substitute is unclear. On a gallon per gallon comparison, the energy balance is negative - you travel less far on a liter of ethanol than a liter of gasoline. Proponents of ethanol production argue that technological advances have led to better conversion ratios and that additional opportunity costs from the entire fuel cycle must be factored in. This argument has lead to an increased interest in the co-products of ethanol production.

The value of co-products helps reduce per gallon costs of production for ethanol. Different milling processes produce different co-products. Wet milling processes can also produce corn oil, corn gluten meal, corn gluten feed, and carbon dioxide. Canada's smaller and earliest ethanol plants are wet milling plants. These plants, however, only produce wet distillers grains as co-products, since they do not meet the economies of scale needed to warrant the production and marketing of the other potential co-products. These plants produce wet distillers grains that are consumed by local cattle. Potential for large-scale wet milling plants is limited as the large cattle and dairy production does not take place in areas close to the ethanol plants. It is for this reason that Canada's large scale plants are dry-milling plants for which the by-products are distillers dried grain, condensed syrup, and carbon dioxide. By drying the DDGs, it is possible to market this feed substitute to livestock markets that are further away. Possible market intervention by the Canadian Wheat Board may limit a plant's ability to extract full value for its co-product. Additional limiting factors for extracting full value from the co-products and ethanol include a lack of efficient distribution channels and infrastructure.

Infrastructure and shipping logistics of feedstocks, fuel-ethanol and its co-products are also factors that will affect Canadian competitiveness. With most refineries and most of the populations in the east, and much of the increase in production capacities occurring in the west, infrastructure and distribution issues become increasingly important. Industry sources see the short to medium term impact to be increased rail usage. Proximity to railways has been important when choosing a location for an ethanol plant. Ethanol feedstock, ethanol and ethanol co-products will however have to compete with other, perhaps higher priced goods. In recent years, the two major railways in Canada have been facing increased criticism for poor rail services for agricultural goods. Rail connections with neighboring US states may also increase. Overseas deliveries of dried distillers grains is being done via vessels and therefore necessitates getting the co-products to the coastlines.

The ability to compete with petroleum will be affected as the profit margin for ethanol production has been narrowing due to increases in natural gas prices (an energy requirement in dry milling ethanol production), as well as to increases in feedstock costs due to price increases in fertilizers, and on-farm fuel. According to Agriculture and Agri-food Canada (AAFC)'s Farm Fuel and Fertilizer Expenses bulletin, fertilizer prices in 2007 reached record highs and expect this trend to continue in 2008. This increase is driven mainly by increased demand due to high commodity prices, and a world shortage of fertilizer. Increases in fuel costs do not typically change producer's fuel in the short-run, but may change production patterns if high fuel prices persist. Fuel and fertilizer account for 15% of Canadian farm expenses. AAFC predicts that prices for fertilizer increase by 20% in 2008. The high commodity prices, to date, seem to be off-setting the higher crop production input prices.

**B. Impacts of Ethanol Production on Feedstock Markets**

Corn and wheat are the main feedstock for ethanol production in Canada and the introduction of the renewable fuel content by the Canadian government will undoubtedly have an impact on production patterns. At this time, there are no official statistics for the amount of corn and wheat directed into ethanol production. Table 7.1 on the following page provides estimates and forecasts on the quantity of corn and wheat that has and will be

directed into ethanol production. These estimates are based on plants' production capacities and when plants, current and those under contruction, have or are expected to come on line.

**Table 7.1**
**Quantity of Feedstock Used in Ethanol Production*; in MT**

| | 2004 | 2005 | 2006 | 2007 | 2008(f) | 2009(f) | 2010(f) |
|---|---|---|---|---|---|---|---|
| Corn | 360,000 | 560,000 | 635,000 | 1,054,100 | 1,615,440 | 3,177,540 | 3,456,940 |
| Wheat | 150,000 | 150,000 | 189,416 | 455,035 | 694,527 | 977,563 | 977,563 |

*estimates; conversion factors: 1 bushel of corn or wheat = 10 liters of ethanol
1 bushel corn = .0254 MT
1 bushel of wheat = .021772 MT

(i) Ethanol Produced from Corn

The province of Ontario is the largest corn-producing province in Canada and, not surprisingly, where 46% of the Canadian ethanol production takes place. Corn at this time, is the main feedstock for Canadian ethanol production. Corn production also takes place in the province of Quebec.

**Table 7.2**
**Quantity of Corn Used for Feed, Ethanol Production; in TMT**

| | Domestic Corn Production | Corn Imports[1] | Corn Imports[2] from US | Corn for Feed[3] | Corn for Ethanol[4] |
|---|---|---|---|---|---|
| **2004** | 8,837 | 2,101 | 2,098 | 7,440 | 360 |
| **2005** | 9,361 | 2,155 | 2,150 | 7,830 | 560 |
| **2006** | 8,990 | 1,899 | 1,893 | 8,275 | 635 |
| **2007** | 11,649 | 2,580 | 2,554 | 8,900 | 1,054 |
| **2008(f)** | 9725 | 2,800 | 2,775 | 8,550 | 1,615 |

[1,2] import data based on a calendar year, all corn excluding popping corn; source: Statistics Canada
[3,4] no official statistics exist, estimates based on production in a *calendar* year

Corn is estimated to account for 70% of the feedstock used in ethanol production in Canada in 2007. In 2008, 2009, and 2010, corn is expected to account for 70%, 76%, and 78% of ethanol feedstock, respectively, as more corn based ethanol plants come on-line. In 2007, it is estimated that 1,054 thousand metric tons (TMT) of corn was directed into ethanol production. In 2008, it is estimated that 1,615 TMT of corn will be directed towards ethanol production, a 53% increase from 2007 levels. Despite this increase in demand, the corn plantings decreased in 2008 due to high supplies resulting from Quebec and Ontario producers planting record amounts of corn in 2007. Canada is forecast to produce 9.725 million metric tons (MMT) of corn in 2008, a 17% decrease over 2007 levels, and to import 2.800 MMT, mainly from the US. The forecasted increase in corn imports is due to lower levels of domestic supply. With the forecasted expansion of the corn-based ethanol industry in 2009, the amount of corn required to meet production needs in 2009 is an estimated 3.277 MMT (see table 7.1), nearly double the year 2008 requirements.

The increase in demand for corn by the ethanol plants, and Canada's limited corn-production capacity due to climatic factors will result in the feed and ethanol industry in Canada competing for corn. Many analysts say that this reduction in corn availability could be met with the ethanol by-product of dried distillers grains. The Canadian livestock industry disagrees and has been very vocal on this issue, pointing to increases in feed costs as a reason for lower livestock output. Other private industry sources reject this reasoning, arguing that if the livestock industry were healthy prior to the feed price increases, the livestock industry would simply pass on the cost to consumers. This has not been possible as the Canadian livestock industry is having trouble regaining its international beef markets in the post-BSE era. Industry sources also point to structural problems in the domestic pork packing industry as Canadian pork packers struggle to remain competitive in an ever increasingly competitive world market for pork. In addition, the strengthening Canadian dollar continues to pressure Canadian meat exports on the international scene and this comes back to gnaw at producers via lower bid prices by domestic packers. Any shortfall in the ability to meet demand for corn domestically due to the re-direction of corn into ethanol use and away from feed will likely be met by US imports of corn. However, the volume of potential increases in US corn imports will be mitigated by a shrinking Canadian livestock industry (and therefore a reduced demand for feed), the untapped corn growing capacities in Ontario and Quebec, high corn prices, and the ability to use feed corn substitutes for such as barley and DDGs.

There are concerns, however, that the demand for corn will crowd out the production of other crops and that producers will forgo the traditional corn-soybean rotation in order to take advantage of the market conditions. In addition, policy measures have been put in place that encourages the production of corn. For example, while the costs of production have increased significantly, and could influence planting decisions away from corn, the federal government has introduced funding to mitigate the impact of these increases. While theoretically, increased corn costs also narrow the profit margins for corn-based ethanol production and could slow down production, federal production incentive programs and some provincial programs mitigate increases in inputs costs for ethanol production.

(ii) Ethanol Produced from Wheat

Wheat is the feedstock for most of the remaining 30% of Canada's ethanol production in 2007. It is expected to account for 30%, 24% and 22% of the ethanol feedstock for years 2008, 2009, and 2010, respectively. The newer wheat ethanol plants have more flexibility built-in as the pipes are larger and allow the use of other feedstock, such as corn, when wheat feedstock may be too expensive. The Husky Energy's wheat-based ethanol plant in Minnedosa, Manitoba uses corn when wheat feedstock was unavailable or too expensive. There is only a limited opportunity for U.S. corn producers. Husky Energy has agreed that 80% of the feedstock used to produce ethanol will come from Manitoba producers. The agreement is with the Manitoba government and expires after 8 years. Unlike corn, Canada produces ample quantities of wheat, which could be used to meet ethanol production expectations.

**Table 7.3**
**Quantity of Wheat Used for Feed, Ethanol Production; in TMT**

| | Domestic Wheat Production | Wheat Imports[1] | Wheat Imports[2] from US | Wheat for Feed[3] | Wheat for Ethanol[4] |
|---|---|---|---|---|---|
| **2004** | 25,860 | 14 | 14 | 5,056 | 150 |
| **2005** | 26,775 | 18 | 17 | 5,056 | 150 |
| **2006** | 25,265 | 26 | 25 | 4,800 | 189 |
| **2007** | 20,054 | 25 | 23 | 4,000 | 455 |
| **2008(f)** | 24,200 | 25 | 22 | 4,000 | 695 |

[1,2] import data based on a calendar year and includes only HS code 1001; source: Statistics Canada

[3,4] not official statistics, estimates based on production in a *calendar* year

As shown in table 6.3, in 2008, it is estimated that 695 thousand metric tons (TMT) of wheat will be directed towards ethanol production, a 52% increase from year 2007 levels. Canada is forecast to produce 24.1 MMT of wheat in 2008, a 20.7%% increase from 2007 levels. By 2009, the openings of wheat-based ethanol plants in Western Canada will increase the demand of wheat destined for ethanol production to 978 MMT (see table 7.1), which represents a 41% increase over the estimated 2008 wheat demand for ethanol of 695 MMT.

As the ethanol industry grows, demand for different wheat varieties is also expected to grow resulting in increased competition between wheat end-users, such as the Canadian ethanol producers, livestock producers and the milling industry. The need for high-yielding, low-protein wheat by the livestock industry and the ethanol plants are in direct conflict with the needs of the flour industry. Increases in ethanol efficient wheat is expected to affect production patterns and result in more Canadian wheat farmers seeding area to lower protein/high starch wheat such as Winter Wheat and Canadian Prairie Spring Wheat rather than higher protein/lower starch wheat varieties used by the milling industry. The livestock sector, especially the hog sector, competes for the same wheat varieties as the ethanol sector. There are additional layers of complication when using wheat as a feedstock in ethanol production, depending on the co-products produced and the markets for which they are destined. The Canadian Wheat Board (CWB) controls the sales of wheat for human consumption and export and therefore as long as the ethanol is going to be used as fuel and the DDG's are going to be fed to livestock, the CWB has no involvement. If the plant fractionates the grain to create by-products that can reduce the cost of production for each liter of ethanol, and it removes components that can be used for human consumption such as wheat gluten, then a portion of the wheat technically, has, to be purchased through the CWB. For the most part, ethanol plants purchase their wheat in the same way a feed mill does, either directly from farmers or from a grain company. While the CWB promotes industrial uses for its western-grown grains, its current position is that although its mandate allows it to enter the market for sales of wheat for ethanol production, it will not do so.

(iii) Ethanol Produced from Sugercane or Sugar Beets

Canada does not produce ethanol from sugarcane or sugar beets, nor are there any expectations that it will on a large scale.

**C. Impacts of Bio-Diesel Production on Feedstock Markets (new/updated)**

(i) Bio-Diesel Produced from Canola and Animal Fats/Oils

With a 2% bio-diesel mandate in place, the choice of feedstock comes into question. While bio-diesel can be made from a variety of feedstocks, feedstock prices and availability are the determining factors of which one will be used. While canola, due the abundance of the Canadian production, was thought to be the natural choice for feedstock, studies suggest that this may be a challenge with a 2% bio-diesel mandate and that a higher mandate for biodiesel may be required. Key competitors facing canola oil for use in bio-diesel are rendered oils (yellow grease), rendered animal fats (tallow), palm oil (which would be imported as Canada does not produce palm oil), and soybean oil. Canola and soybeans are high priced feedstock for bio-diesel since they are priced as food oils in the international markets while palm oil and rendered fats are priced at feed and industrial use levels.

Table 7.4 illustrates the consumption of feedstock by Canada's nascent bio-diesel industry.

**Table 7.4**
**Quantity of Feedstock Used in Bio-diesel Production*; in million liters**

| | 2004 | 2005 | 2006 | 2007 | 2008(f) |
|---|---|---|---|---|---|
| Soybean oil | 0 | 0 | 0 | 0 | 0 |
| Rapeseed Oil | 0 | 0 | 0 | 0.99 | 0.99 |
| Palm Oil | 0 | 0 | 0 | 18 | 18 |
| Animal Fats | 0 | 0 | 35 | 35 | 35 |
| Recycled Vegetable Oil | 0 | 0 | 0 | 42 | 42 |
| Conversion factor: 1 liter feedstock = 1.10 liters bio-diesel | | | | | |

Canola production has reached record high levels in recent years, and increased demand from canola oil for use as a healthy oil in the food retail industry has resulted in higher prices. Canola producers have responded by planting record acres. Despite this supply response, some industry observers suggest that canola could remain too expensive, and that a 2% bio-diesel blend could be met with cheaper feedstock. As the demand for the cheaper feedstock increases, so will their prices. This may result in canola being used to fill the void created in various markets such as the soap and chemical markets. Industry information indicates that a demand for 503 million liters of bio-diesel demand could and will likely be met using feedstocks that come from yellow grease and palm oil. In this scenario, canola oil use would remain mainly for food, with some going into soap and chemical production and feed and an even smaller amount going for export. In addition, canola may be used as an additive to bio-diesel to help improve the flow and storability issues that often complicate bio-diesel production. Soybeans would be used exclusively for food use and tallow would be reallocated from feed use into bio-diesel.

While canola use for bio-diesel by-itself may be expensive, the co-products from biodiesel production may make the economics work. Canadian Bioenergy is building a large scale biodiesel plant that is to use canola as a feedstock. The plant will also be producing glycerine as a co-product. Co-products and the production capacity of the plants (it would be capable of supplying over 40% of the federal 2% biodiesel mandate), and the province of British Columbia's 5% biodiesel mandate may be the reason the economics will work in today's high commodity prices.

### D. Fuels Produced from Other Bio-Mass

There has been growing interest and investment in producing bio-energy from sources other than the traditional grains of corn and wheat. There have been a series of announcements over the last year of joint ventures to make cellulosic ethanol and biogas. Two of the most significant announcements include the joint cellulosic ethanol ventures announced by GreenField Ethanol and Enerkem, as well as Iogen's plans to build a commercial scale cellulosic ethanol plant in Saskatchewan.

In 2008, GreenField Ethanol and Enerkham announced plans to built and operate a commercial cellulosic ethanol plant using Enerkem's technology. Enerkham, a Quebec-based gasification and catalysis technology company, has developed technology which converts biomass such as municipal solid waste and wood residue into cellulosic ethanol. In June 2008, the companies made the announcement that the plant would be built in Edmonton. The $70 million facility will initially produce 36 million liters of biofuel a year. The City of Edmonton and the Government of Alberta through the Alberta Energy Research Institute are contributing $20 million to the facility.

Information on Iogen's plans for a cellulosic ethanol plant, please see the section on IOGEN.

Biogas is also of increasing interest and investment. Two of the three bio-energy projects granted funding under Alberta's Biorefining Commercialization and Market Development Program and the Bio-energy Infrastructure Development Program are for the development of biogas as an alternative source of energy. Kingdom Farm Inc. received a significant grant to review the potential for bio-gas being applied to large sale Alberta hog operations. Highmark Renewables Research also received a significant grant to carry-out bio-gas feasibility study on a large scale dairy operation.

### E. Potential Trade Impacts

As Canada continues to build its bio-fuel production capacity through its diverse federal and provincial programs/strategies, potential trade issues such as World Trade Organization disciplines, biotechnology, and inter-provincial barriers that are contrary to the national treatment principle embodied in the WTO and the NAFTA may present policy complications.

Provincial incentives that create trade barriers by having only ethanol produced from feedstock produced in-province may face increased scrutiny as they violate the national treatment embodied in the WTO and NAFTA as they are barriers to trade.

These concerns are likely still a long ways off as an international trade/market for ethanol and bio-diesel has yet to develop. In the meantime, Canada will be concentrating its efforts on building up the industry.

The possibility of significant volumes of ethanol trade, especially between the northwest U.S. and Western Canada (wheat-ethanol to the United States and corn-based ethanol to Canada), is unlikely to develop in the short to medium term. This is due mainly to the fact that Canada does not have excess ethanol production capacity, which would permit exports being shipped to the United States. In addition, the transportation, distribution and infrastructure issues around ethanol trade have yet to be resolved.

No official trade statistics exist for either fuel ethanol or bio-diesel trade. However, industry statistics suggest that Canadian imports of fuel ethanol are exclusively from the US, and for the 2002-2007 period, these imports have hovered around 70-100 million liters a year.

There is some statistical data available for fuel ethanol exports to the U.S. These are presented in the table below.

**Table 7.5**

**U.S. Oxygenates Fuel Ethanol Exports to U.S.**

(in Thousand Barrels)

| 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|
| 148 | 77 | 196 | 58 |

Source: Energy Information Administration

Canada does, however, provide trade statistics for industrial ethanol. The bulk of industrial ethanol trade (HS 22.07.10 and 22.07.20) takes place with the United States (see table 7.6a,b, 7.7a,b). In 2007, Canadian exports of denatured alcohol (ethanol that cannot be used for beverages nor for hospital use) was 19 million litres pure alcohol (MLPA) and was destined almost entirely for the U.S. market. Canadian exports of undenatured alcohol jumped significantly in 2007 (nearly doubling from year 2006 levels) to 39.6 MLPA, with 70% of those exports being sent to the U.S.

**Table 7.6a**

**Canada Ethanol Exports (2003-2006); in '000 Liters Pure Alcohol**

| HS code | Description | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|
| | Total Ethanol | 29,340 | 35,439 | 57,413 | 58,683 |
| ***220710*** | Undenatured | 11,008 | 16,606 | 19,957 | 39,627 |
| ***220720*** | Denatured | 18,332 | 18,834 | 37,457 | 19,057 |

Source: World Trade Atlas, Statistics Canada

**Table 7.6b**

**Canada Ethanol Exports to U.S. (2003-2006); in '000 Liters Pure Alcohol**

| HS code | Description | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|
| | Total Ethanol | 22,867 | 23,703 | 40,698 | 42,780 |
| ***220710*** | Undenatured | 9,037 | 9,867 | 8,460 | 27,824 |
| ***220720*** | Denatured | 13,830 | 13,836 | 32,238 | 19,056 |

Source: World Trade Atlas, Statistics Canada

As illustrated in table 7.7a,b, Canadian imports of denatured ethanol also increased significantly. Imports of undenatured ethanol dropped to 23.095 MLPA in 2006 from 34.782 MLPA in 2007. There was a corresponding drop of imports from the U.S., which fell to 15.145 MLPA in 2007 from 51.994 MLPA in 2006. The drops in undernatured ethanol which can be used for the production of fuel-grade ethanol is likely the reflection of Canada's growing ethanol production capacity.

**Table 7.7a**

**Canada Ethanol Imports (2004-2007); in '000 Litres Pure Alcohol**

| HS code | Description | 2004 | 2005 | 2006 | 2007 |
|---|---|---|---|---|---|
| | Total Ethanol | 156,242 | 152,058 | 100,325 | 553,854 |
| ***220710*** | Undenatured | 35,993 | 29,397 | 34,782 | 23,095 |
| ***220720*** | Denatured | 120,249 | 122,661 | 65,530 | 530,759 |

Source: World Trade Atlas, Statistics Canada

| Table 7.7b | | | | | |
|---|---|---|---|---|---|
| **Canada Ethanol Imports from U.S. (2004-2007); in '000 Liters Pure Alcohol** | | | | | |
| **HS code** | **Description** | **2004** | **2005** | **2006** | **2007** |
| | Total Ethanol | 135,463 | 113,536 | 78,379 | 455,412 |
| ***220710*** | Undenatured | 33,361 | 21,809 | 26,385 | 15,145 |
| ***220720*** | Denatured | 102,101 | 91,726 | 51,994 | 440,267 |
| Source: World Trade Atlas, Statistics Canada | | | | | |

## 8. Conclusion

The federal government's bio-fuel strategy has resulted in increased bio-fuel production capacity in Canada. However, Canada's ability to compete in grain-based ethanol production with the U.S. or low-cost production countries without government subsidies and market intervention is limited. The long term-viability of the Canadian grain-based bio-fuels industry will depend on a multitude of factors including size, production types, co-products, feedstock costs, and energy prices. The required increase in bio-fuel production required by the federal mandate will necessitate a build up in infrastructure. The new demand driver for grains from the renewable fuel industry world-wide has intensified the competition between grains for industrial use and for feed and food usages. This is having a significant impact on agriculture in Canada as the increase in demand for grains has lead to increases in grain prices, land values, and input costs such as fertilizer and herbicides. Cellulosic ethanol provides the best means of achieving the environmental objectives of the Canadian bio-fuel mandate, and there seems to be increasing levels of investment in this technology.

Better trade statistics are needed to measure the trade developments of the bio-fuels market and the markets for the co-products. Canada's limited production capacity, both in the short and medium term suggests that Canada's entry into the global ethanol market is still quite distant. While the possibility of increased ethanol trade, especially between the northwest U.S. and Western Canada (wheat-ethanol to the United States and corn-based ethanol to Canada), is unlikely to develop in the short to medium term, there is an increasing amount of trade taking place in the co-products of ethanol production.

## 9. Note of Appreciation

The section on the provincial biofuels policies was completed with the help of Charles Greenough of the Fuel Tax Council and his counterparts within the provincial ministries. A sincere "thank you" goes out to the provincial teams for their contribution in helping make the report as accurate as possible.

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