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Biofuels Annual

2015

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Report Highlights:
Lower rates of discretionary blending are expected to result in lower ethanol production and lower imports of U.S. ethanol for 2015 and 2016. Economic slowdown due to low oil prices is expected to reduce demand for biodiesel and renewable diesel. Low oil prices are squeezing profit margins of Canadian ethanol producers, especially those that do not have robust co-product lines.

Executive Summary:

Canada's federal biofuels blend mandate stands at 5 percent renewable content (ethanol) in gasoline and 2 percent renewable content in distillate (diesel) consumption pools. Provincial blend mandates for ethanol range from 8.5 percent in Manitoba to 5 percent across many provinces. Provincial blend mandates for renewable content in diesel range from 4 percent in British Columbia to 2 percent across many provinces. There is currently a lack of political support to go beyond where current mandates are set. Provincial and federal production incentives are scheduled to sunset on March 31, 2016 and March 31, 2017, respectively.

Canadian demand for fuel ethanol exceeds its domestic supply due to domestic production capacity unable to meet the requirements of the federal mandate. As a result, Canada imports close to 20 percent of its domestic consumption, nearly all of it from the United States.

Ethanol production is expected to fall to 1.650 million liters in 2015 and remain at that level in 2016 due to a reduction in discretionary blending resulting from low oil prices. This represents a 3.4 percent decrease from 2014 production levels of 1.708 million liters.

Lower rates of discretionary blending due to high low oil prices are expected to result in a drop in ethanol imports. Year-to-date data suggests that fuel ethanol exports to Canada will fall 13 percent from 2014 levels of 1.20 million liters to 1.05 million liters. The same level of imports is forecast for 2016.

Higher feedstock costs for canola-feedstock based plants are expected to result in slightly lower production of biodiesel. In addition, a drop in domestic demand is anticipated due to the economic slowdown in Canada related to low oil prices. Production is anticipated to fall to 305 million liters in 2014, a 10 percent decrease form 2014 levels. The same production level is forecast for 2016.

Despite domestic production being able to meet nearly 75 percent of the federal mandate for renewable content in diesel, almost all domestically produced biodiesel is exported to the United States as a result of the U.S. blenders tax credit. This trend is expected to continue into 2015 and 2016.

Total biodiesel and HVO imports are forecast to fall in 2015 to 480 million liters, a decrease of 10 percent from 2014 import levels. This is again due to the economic slowdown in Canada related to low oil prices. Import share of U.S. biodiesel is expected to increase due to increased competition from California which has further increased the price of HVO compared to biodiesel. In 2016 imports of biodiesel and HVO are forecast to remain at levels similar to those in 2015.

Due to the increasing cost of HVO, Post forecasts that U.S. biodiesel will make up an increasing share of total imports – rising to 67 percent from 56 percent in 2014.

I. ***Policy and Programs***

In Canada, environmental objectives rather than energy security has been the driver behind the development of federal and provincial policies and programs designed to encourage the development of a domestic renewable fuels industry. In 2007, the Government of Canada committed to reducing Canada's total GHG emissions by 20 percent from 2006 levels by 2020 (or approximately 280 megatonnes of carbon dioxide equivalent (MT CO2e) below forecasted 2020 levels), and biofuels was part of the strategy to reach that objective. Federal blend mandates for biofuels was seen as a way to promote a more consistent approach to achieving significant reductions in emissions of air pollutants and GHGs. To a lesser extent, the renewable fuels policies were also seen as a means to encourage rural economic development and help diversify revenue streams for agricultural producers who were highly dependent on export markets through increasing domestic demand for crops. .

Energy is a joint federal and provincial responsibility in Canada and it is for this reason that programs and incentives to support energy development are found at both levels of government. In Canada, many of the provincial governments put in place provincial biofuel blend mandates well ahead of the federal strategy for the development of a domestic renewable fuels industry that was put into place in 2006/2007. Due to the focus on at the federal level and provincial level on emissions, foreign suppliers can achieve a competitive edge by supplying lower carbon intensity (CI) fuels. This is particularly true in the case of ethanol.

FEDERAL BIOFUEL POLICY STRUCTURE

At the federal level, blend mandates and production incentives have been the cornerstone of the federal strategy to grow the domestic biofuels industry.

Federal Blend Mandate

Currently, regulations under the Canadian Environmental Protection Act (1999) require a 5 percent renewable content in the Canadian gasoline pool, and a 2 percent renewable content in the distillate pool, excluding heating oil. There are a few excluded volumes from the gasoline pools and distillate pool which include gasoline, diesel fuel or heating distillate oil sold for or delivered for use in aircraft, competition vehicles, feedstock for the production of chemicals (other than fuel), military combat equipment, space heating purposes and gasoline or heating distillate oil sold for or delivered, represented as kerosene for use in unvented space heater, wick-fed illuminating lamps, or flue-connected stoves and heaters. Also excluded is gasoline, diesel fuel or heating distillate oil for export or transit through Canada, as well as renewable fuel.

Some partial exemptions are made for the use of biocrude. According to the regulations, a primary supplier may subtract from their gasoline pool for a gasoline compliance period 20 percent of the volume, if any, of biocrude, other than triglyceride-derived biocrude, that they used as feedstock to produce liquid petroleum fuel during the gasoline compliance period. In terms of the distillate pool, a primary supplier may subtract from their distillate pool for a distillate compliance period (*a*) 20 percent of the volume, if any, of biocrude, other than triglyceride-derived biocrude, that they used as feedstock to produce liquid petroleum fuel during the distillate compliance period; and (*b*) 85 percent of the volume, if any, of triglyceride-derived biocrude that they used as feedstock to produce liquid petroleum fuel during the distillate compliance period.

The full regulations can be found at the following URL address: Renewable Fuel Regulations. The overall structure is similar to the Renewable Fuel Standard in the United States, with the point of compliance being the point of production or importation. The RFS regulations fall under the Canadian Environmental Protection Act (CEPA).

Production Incentives

Federal production incentives are scheduled to sunset on March 31, 2017. Production incentives are administered by the Federal Department of Natural Resources (NRCan) through the ecoEnergy for Biofuels program. ***Table 1*** below illustrates the incentive rates for ethanol and renewable/biodiesel production. There are 16 ethanol producing plants that have signed the contribution agreements under the program. The contribution agreements require the participants to provide to NRCan production and financial data which includes but is not limited to anticipated eligible sales, annual audited financial statements, and environmental performance data. There are no requirements that the production must be supplied to the Canadian marketplace.

Table 1: Federal Production Incentive Rates

Fiscal Year (April 1- March 31)	ecoEnergy Incentive Rates for Ethanol Production in dollars/liter ($/L)	ecoEnergy Incentive Rates for Renewable Diesel/Biodiesel Production in dollars/liter ($/L)
2008/2009	0.10	0.26
2009/2010	0.10	0.24
2010/2011	0.09	0.20
2011/2012	0.08	0.18
2012/2013	0.07	0.14
2013/2014	0.06	0.10
2014/2015	0.05	0.08
2015/2016	0.04	0.06
2016/2017	0.03	0.04

Blend Mandates

Canada's western provinces, as well as the province of Ontario, have blend mandates in place. The province of Quebec has an aspirational mandate of 5 percent renewable content for gasoline, but has concentrated most of its support on the development of cellulosic ethanol. Quebec has a policy that limits the use of corn ethanol production beyond the one existing plant in the province. The provincial blend mandates for ethanol require that fuel producers or suppliers replace the mandated percentage of their gasoline available for sale with ethanol. In the case of biodiesel, provincial mandates require fuel suppliers or fuel producers to blend the mandated amount of biodiesel in their overall sales of on and off-road diesel fuels. ***Table 2*** on the following page summarizes the provincial blend mandates for ethanol and biodiesel that are currently in place. There is currently a lack of political support to go beyond where current mandates are set.

Table 2: Provincial Blend Mandates

Province	Ethanol Blend Mandate for Gasoline	Renewable Fuel Blend Mandate for Diesel
British Columbia	5 percent	4 percent
Alberta	5 percent	2 percent
Saskatchewan	7.5 percent	2 percent
Manitoba	8.5 percent	2 percent
Ontario	5 percent	2-4 percent*

Production Incentives

Production incentives have also been part of the provincial strategies to build up a domestic biofuels economy. The production incentive of 10 cents a liter for ethanol produced and sold in Manitoba to fuel suppliers' sunset this year (at the end of March, 2015). The Saskatchewan Renewable Diesel Program incentive of 13 cents per liter of eligible renewable diesel to qualifying producers will sunset at the end of March 2016. Alberta's biodiesel production incentive that varies between $0.09 and $0.13 per liter, depending on plant size, will sunset on March 31, 2016. Discussions with provincial agencies indicate that subsidies are unlikely to be renewed, except for, perhaps, advanced biofuel production as defined by the respective province.

Impact of Carbon Taxes on Demand for Biofuels in Canada

Provinces have been taking the lead in instituting measures which place a tax on carbon; however the impact of biofuels demand is likely to remain limited. Four Canadian provinces have instituted different measures by which a tax has been put on carbon. Alberta taxes its largest carbon emitters, including oil sands and power producers, and the province of British Columbia has an economy-wide carbon tax. In 2015, the province of Ontario announced its intention to join the carbon cap and trade program that Quebec and California participate in. Also in 2015, Quebec added fuel suppliers, previously exempted, to the cap and trade program. Lack of infrastructure such as blending facilities and the possibility to offer consumer higher blends such as E15 or E85 limit the possibility of using biofuels in transportation as a means of meeting the objective of the cap and trade programs. There are two provinces that do have in place regulations that have the potential to increase provincial blend levels above federally or provincially mandated levels. These regulations are the Low Carbon Fuel Standard in British Columbia and the Greener Diesel Regulations in Ontario.

i. British Columbia's Low Carbon Fuel Standard

Columbia has included, in addition to its blend mandate of transportation fuel, a low carbon fuel standard with prescribed carbon intensity limits that decrease 10 percent between 2010 and 2020. The carbon intensity limit for gasoline class fuel and the diesel class fuel is set out in the table 3 on the following page:

Table 3: Carbon Intensity Limits

COLUMN 1 Compliance Period	COLUMN 2 Carbon Intensity Limit for Gasoline Class Fuel	COLUMN 3 Carbon Intensity Limit for Diesel Class Fuel
	(g CO_2e/MJ)	(g CO_2e/MJ)
July 1, 2013 to December 31, 2014	86.20	92.38
2015	85.11	91.21
2016	84.23	90.28
2017	82.93	88.87
2018	81.62	87.47
2019	80.31	86.07
2020 and subsequent compliance periods	78.56	84.20

Compliance by fuel suppliers can be achieved by (1) supplying low carbon fuels that reduce the overall carbon intensity of supplied fuels to below the prescribed limit in each compliance period, or (2) by credit trading and acquiring credits from other suppliers or (3) by entering into agreements with the Director to take actions or cause others to take actions that would have a reasonable possibility of reducing GHG emissions through the use of lower carbon intensity fuels sooner than would occur without the agreed-upon action. Such agreements are intended to help offset some of the risks associated with actions that may not be currently economically viable but that would provide future pathways for compliance. One example is supplying E85 when the demand for E85 is uncertain.

In the short run, the carbon intensity reduction targets may lead to blend rates of renewable content in gasoline and biodiesel in British Columbia rising to levels of 10 percent ethanol and 5 percent biodiesel. In the longer run, it may provide an incentive for more investment in blending infrastructure which could results in even higher blends levels being available to consumer (E15, E85, B20)."

http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/00_08016_01
http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/394_2008

ii Ontario Greener Diesel

The province of Ontario had originally stated its intention to implement a Low Carbon Fuel Standard with a goal of lowering carbon by ten percent in transportation fuels sold in the province by 2020. Due to concerns around the lacks of fuels that would be able to meet an LCFS target, the complexity of modeling life-cycle emissions, the possibility of fuel shuffling, the provincial government has decide to pursue instead the development of a cap and trade program to meet its objectives set out in the 2007 Climate Change Action Plan. The province did however put in place an emissions reduction requirement on its diesel pool, in addition to a renewable content in diesel blend mandate. Currently, the minimum requirement is that renewable diesel content added to the conventional diesel must have a

GHG performance that is at least 50 percent lower than petroleum-based diesel based on a life cycle analysis. The better the performance of the renewable diesel has from a GHG performance approach, the greater the compliance units are granted. For example, one liter of greener diesel that achieves a GHG reduction of 100 percent relative to petroleum diesel would be worth two liters for compliance purposes. One liter of greener diesel that achieves a 25 percent reduction would be worth half of a litre. Beginning in 2016, fuel suppliers would be required to blend an average of 4 percent renewable diesel on an annual basis, with a GHG performance of 70 percent better than conventional diesel. Thus depending on the GHG performance of the renewable diesel chosen to blend, and thereby the ability of the blender to acquire compliance units, the actual blend level province wide may be lower than 4 percent.

More on this regulation can be found at the following URL address:
http://www.ontario.ca/laws/regulation/r14097

OUTLOOK FOR BIOFUELS POLICIES

At the time of this report, Canada was undergoing a federal elections process with all three main parties showing the possibility of forming the next government, and therefore the direction that biofuels policies will take remains uncertain. Discussions with federal agencies suggest that the federally mandated renewable content in gasoline will not increase beyond current levels for the next 10 years, at least. Domestic production capacity continues to fall short of domestic demand, necessitating that a significant portion of the federal mandate for ethanol being met through imports. The lack of blending infrastructure and resistance from fuel suppliers, especially those that are fully integrated refinery and retailers, to engage in actions that will result in increased competition will limit supply of biofuels of higher blends. In addition, two of the three main political parties' vying to form the next federal government favors second generation ethanol over conventional ethanol cellulosic. Any potential increase in a federal mandate may be directed at filling it with second generation ethanol, and the production capacity of cellulosic ethanol on a commercial scale necessary to meet such an increase in domestic demand is still at least 10 years away. However, the proposed corporate average fuel economy (CAFE) standards in the United States requiring 54 miles/gallon on average by the year 2025, which Canada endorses, may help garnish support needed to increase federal blend mandates.

The outlook for an increase in the federal mandate for renewable diesel may be a little brighter. The Canadian Renewable Fuels Association (CRFA), the main lobby vehicle for the Canadian renewable fuels industry in Canada, is lobbying for an increase in the renewable content mandate for the distillate pool. The CFRA would like the federal renewable diesel blend mandate be increased from its current 2 percent level to 5 percent by the year 2020. Renewable diesel has faced less controversy and is supported by all three political parties. With domestic production capacity of renewable diesel catching up to domestic demand, the longer term outlook for an increase in the renewable diesel blend mandate is more positive. Post however, does not predict an increase in mandate for at least the next three years.

At the provincial level, the likelihood of increased mandated blend levels and the renewal of provincial production incentives are unlikely. Provincial policies in the most emissions intensive constituencies (Alberta, Ontario, Quebec and BC) have begun to focus on how to motivate reductions in carbons intensities but have left the choice of how best to do this to the market. These programs should be monitored closely as it may result in the federal government implementing federal policies to help

smooth out regional differences these policies can cause.

Data on petroleum fuel supply and demand is available by Statistics Canada; however the quality of the data per sector is not very robust and should be used with caution. A breakdown of energy use by fuel type reveals that gasoline and diesel fuel account for an average of 38 percent and 28 percent, respectively, of the fuel type used in the period 2009-2012 and dominate as the transportation sector's main energy sources. ***Table 4*** illustrates Post's projections through 2023 based on the assumptions developed by the National Energy Board.

Table 4 - Fuel Use Projections (Liters - specify unit)

Calendar Year	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Gasoline Total	42,955	42,300	42,250	42,105	41,930	41,872	41,705	41,608	41,530	41,445
Diesel Total	34,840	35,470	36,240	36,950	38,250	38,890	39,420	39,940	40,460	40,990
On-road	17,420	17,735	18,120	18,475	19,125	19,445	19,710	19,970	20,230	20,495
Agriculture										
Construction/mining										
Shipping/rail										
Industry										
Heating										
Jet Fuel Total										
Total Fuel Markets	77,795	77,770	78,490	79,055	80,180	80,762	81,125	81,548	81,990	82,435

III. Ethanol

STATISTICS

Table 5: Ethanol Used as Fuel and Other Industrial Chemicals (in million liters)										
Calendar Year	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Beginning Stocks	46	72	101	108	128	127	130	131	130	125
Fuel Begin Stocks	46	72	101	108	128	127	130	131	130	125
Production	700	1,145	1,425	1,530	1,790	1,780	1,815	1,820	1,765	1,765
Fuel Production	615	960	1,340	1,445	1,700	1,695	1,730	1,708	1,650	1,650
Imports	528	449	222	449	1,124	1,173	1,370	1,400	1,370	1,370
Fuel Imports	13	11	6	11	450	893	1,214	1,200	1,050	1,050
Exports	23	34	78	64	40	6	4	3	3	3
Fuel Exports	1	2	57	46	35	0	0	0	0	0
Consumption	1,179	1,531	1,562	1,895	2,875	2,944	3,180	3,217	3,132	3,132
Fuel Consumption	601	940	1,282	1,390	2,116	2,585	2,943	2,909	2,705	2,705
Ending Stocks	72	101	108	128	127	130	131	131	130	125
Fuel Ending Stocks	72	101	108	128	127	130	131	130	125	120
Production Capacity										
Number of Refineries	9	13	14	15	15	14	15	15	15	14
Nameplate Capacity	580	810	1,297	1,429	1,818	1,815	1,760	1,800	1,800	1,775
Capacity Use (%)	106%	119%	103%	101%	94%	93%	98%	95%	92%	93%
Co-product Production (1,000 MT)										
DDGs	500	680	885	980	1,220	1,075	110	110	110	110
WDG	30	325	510	575	550	635	650	650	650	650
Corn Oil	0	0	2	2	2	3	6	6	6	6
Feedstock Use (1,000 MT)										
Corn	1,200	2,025	2,585	2,800	3,201	3,285	3,200	3,250	3,250	3,250
Wheat	300	355	760	770	970	850	1,000	1,000	970	940
Market Penetration (Liters - specify unit)										
Fuel Ethanol	601	940	1,282	1,390	2,116	2,585	2,943	2,909	2,705	2,705
Gasoline	40,848	40,496	41,028	41,453	42,076	42,033	42,903	43,522	43,000	42,500
Blend Rate (%)	1.5%	2.3%	3.1%	3.4%	5.0%	6.1%	6.9%	6.7%	6.3%	6.4%

Production

The ethanol industry has consolidated, leaving only the bigger players, and those that remain are producing at capacity. A complete list of the plants can be found at the CRFA website: www.greenfuels.org. Canadian ethanol plants for the most part have operated at maximum capacity since 2009. Demand for fuel ethanol has generally exceeded domestic supply due to the implementation of provincial mandates and the federal blends mandates. Until recently, the availability of the federal and provincial support programs has been sufficient for the plants to operate positive cash flows despite spikes in feedstock prices and competition from U.S. imports.

Since mid-2014 and into 2015, low gas prices (which leads to low ethanol prices), the sunsetting of provincial subsidies, and competition from cheaper U.S. ethanol has meant that many of the older and smaller ethanol plants that do not have a robust co-products line are struggling as profit margins are squeezed. The NorAmerica BioEnergy Crop ethanol plant in Saskatchewan, a 25 million liter ethanol plant that used 60,000 tons of feed quality grain (mostly wheat) shut down in mid-2015, and it is unclear on whether or not it will re-open. Post has assumed it will not.

The Enerkem cellulosic plant was not included the domestic production numbers due to the fact that it is not conventional ethanol; so also not included in the capacity. In addition, the plant is not currently producing ethanol from municipal waste but instead is producing methanol because the economics are currently better converting only up to the methanol stage.

Bioethanol production estimated for 2015 and forecast for 2016 is 1.650 billion liters, a 3.4 percent decrease from 2014 production levels of 1.708 billion liters Lower gasoline prices are resulting in lower demand for discretionary blending. Factors most affecting changes in production include gasoline prices and technological improvements.

Domestic production capacity will likely remain at 1.8 billion liters unless economics change substantially. Canada, unlike the United States has not reached a domestic production capacity that makes it possible to meet its blend mandates with domestic production alone and therefore will continue to import the balance.

As domestic production has increased, so has the production of co-products. Corn oil production has not followed the trend in the United States due in large part to the fact that Canada Feed Regulations require that the Dried Distillers Grains (DDGs) have a minimum amount of energy content that requires more oil remain in the DDGs. Guidance on these regulations can be found at the following website: http://www.inspection.gc.ca/animals/feeds/regulatory-guidance/rg-6/eng/1329275341920/1329275491608

Feedstock choice for ethanol plants has been driven by the availability of feedstock. Corn and wheat are the main feedstock for bioethanol production in Canada. Feedstock use figures are based on Post estimates assuming plants use feedstock grown in their vicinity. There has been an increasing interest in developing corn varieties that can be grown in Western Canada. As more corn varieties are developed with lower heat unit requirements, it is expected that corn use for ethanol production in Saskatchewan and perhaps Alberta will increase. There has also been increasing research on wheat varieties for industrial use. Currently, the need for high-yielding, low-protein wheat by the livestock industry and the bioethanol plants put the industries in conflict with each other when supplies of feed wheat are low. Drought conditions in the province of Alberta are expected to result in lower wheat yields and quality for crop year 2015-2016. Lower feed/industrial wheat supplies forecast for 2015/2016 may lead to a rise in feedstock costs if the demand from the livestock industry remains constant.

In 2015, based on consultation with industry, Post estimates that 77 percent of the domestic production of domestic ethanol will be derived from corn, and 23 percent will be derived from wheat. This will likely remain relatively stable throughout 2016.

Consumption

A use mandate of 5 percent ethanol blended into the gasoline supply currently requires 2.2 billion liters of ethanol. In Canada, the economics of blending will continue to direct discretional blend levels. When the price of gasoline is sufficiently high, and where blend facilities exist, higher levels of discretionary blend levels will exist. In the case of ethanol, it is typically blended at 10 percent where blend facilities exist and 0 percent at locations that don't have blending facilities.

Post forecasts a drop in consumption due to lower discretionary blending forecast for 2015 and 2016. Blending levels will be above the federal average in provinces which have blend mandates higher than the federal mandate or other economic incentives such as carbon intensity requirements, but this will be offset by lower blend levels in provinces that have no provincial blend requirements.

In the long run, the main barrier to higher consumption levels of ethanol remains infrastructure. According to the National Energy Board, 28 percent of retail stations are owned or operated by integrated refiner-marketers. Independent marketers make up the other 72 percent and are reliant on buying their product form Canadian fuel producers or imported fuels. There is a natural resistance from the fuel producers to invest in infrastructure that would result in increased competition.

Trade

Canada does not have the production capacity to meet federal and provincial mandates and must import about close to 20 percent of is consumption to meet minimum federal 5 percent blending requirements. Nearly all imported fuel ethanol comes from the United States. Lower discretionary blending due to the fall in gasoline prices, combined with devaluation of the Canadian dollar is expected to result in lower ethanol imports in 2015 compared to 2014 levels of 1.2 billion liters. Based on year to date trade data (January – June), fuel ethanol imports is to fall to 1.05 million liters in 2015, a nearly 13 percent decrease in 2015 fuel ethanol imports levels.

All domestically produced ethanol is consumed close to where is blended. There is no surplus to export due to the fact that Canada does not produce enough domestically to meet its federal blend mandate.

Due to the North American Free Trade Agreement (NAFTA), there is no tariff on renewable fuels produced in the United States and imported into Canada. However, Canada does have a tariff on bioethanol imported from other countries such as Brazil ($0.05 per liter).

In terms of meeting standards, both corn and wheat ethanol plants in Canada do not have difficulty meeting the Canadian quality standard (CGSB) which is more restrictive than the ASTM standard used in the United States. As a result Canadian ethanol does not have difficulties entering the United States. However, due to differences around minimum moisture content, not all US ethanol producers can meet the Canadian standard and remain price competitive if the cost of removing the moisture is taken into account. This can limit access to the Canadian market.

IV. Biodiesel and Hydrogenated Vegetable Oil (HVO)

STATISTICS

Table 6: Biodiesel (in million liters)										
Calendar Year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Beginning Stocks	5	10	10	10	19	19	4	20	30	20
Production	70	95	110	115	120	100	140	340	305	305
Imports - biodiesel	10	20	15	100	170	261	307	284	330	330
Imports- HVO	0	0	0	30	65	158	242	224	150	160
Total Imports:	10	20	15	130	235	419	549	508	480	490
Exports	65	95	105	110	80	85	123	327	295	295
Consumption	10	20	20	126	275	449	550	511	500	500
Ending Stocks	10	10	10	19	19	4	20	30	20	20
Production Capacity										
Number of Biorefineries	2	5	7	13	9	8	8	8	8	8
Nameplate Capacity	100	131	162	258	225	223	400	400	400	400
Capacity Use (%)	70.0%	72.5%	67.9%	44.6%	53.3%	44.8%	35.0%	85.0%	76.3%	76.3%
Feedstock Use (1,000 MT)										
Canola	0	2	3	3	7	7	35	152	150	150
Animal Fat	68	85	78	78	63	26	30	36	37	37
Recycled Oils	0	3	20	27	46	65	65	84	84	84
Soybean	0	0	1	1	1	0	1	0	0	0
Market Penetration (Liters - specify unit)										
Biodiesel +HVO, on-road	10	20	20	126	275	375	400	400	350	350
Diesel, on-road use	14,722	15,499	15,634	16,823	17,798	17,456	17,893	17,656	17,420	17,420
Blend Rate (%)	0.1%	0.1%	0.1%	0.7%	1.5%	2.1%	2.2%	2.3%	2.0%	2.0%
Diesel, total use	30,000	30,998	31,268	33,646	35,596	34,912	35,786	35,312	34,840	34,840

Production

There has been a great deal of consolidation in the Canadian biodiesel industry over the last ten years, and up until recently the industry has operated far below full capacity. Only the two largest plants have consistently been able to operate at capacity in the past 5 years, and they exported most of their product to the U.S. market. Biodiesel production is jumped 1.5 times in 2014 due to a new 265 million liter capacity biodiesel plant in southern Alberta coming on-line (canola feedstock).

Higher feedstock costs are likely in 2015 and 2016 due to a severe drought in Alberta that is expected to significantly decrease canola yields and may also affect quality. As a result, the operating costs for plants that use canola seed as a feedstock may significantly increase. With most the production from Canada's canola-based biodiesel plant going to export markets in the United States, the blenders' credit in addition to an attractive exchange rate, may help offset the increased cost. For 2015, Post forecast production to fall to 305 million liters due to increased production costs and decreased demand from the United States due to increased domestic production capacity. Post forecasts production to remain at similar levels into 2016. No increase in capacity is expected due to no new plants. There is no HVO production in Canada.

While biodiesel can be made from a variety of different feedstock, prices and availability are the determining factors likely to be considered. Biodiesel quality standards do not specify the use of a specific feedstock; however the cloud point of biodiesel varies on the level of free fatty acids which depends on the feedstock used. Cloud point is an important fuel quality issue especially in colder operating temperatures when fuels begin to gel and clog filters. As temperature falls, animal fat and recycled oil-based biodiesels are first to reach cloud point, palm oil is next followed by soybean oil biodiesel, and canola oil biodiesel is the last to gel. HVO performs even better than biodiesels, with a

cloud point similar to fossil diesels. Some obligated parties have feedstock requirements in their internal purchasing specifications (often requiring that the feedstock be canola based). Many of the Canadian biodiesel plants were not built taking this into account and so the supply chains were not optimized for the feedstocks that the market is looking for.

Also of note, Ontario Greener Diesel requirements will influence the decisions over what renewable diesel fuel to use. As seen in the policy section, feedstock choice will have a large influence over the final carbon intensity of the product and may favor feedstocks such as cooking oil and tallow products. It remains to be seen if this will have a major influence on the purchasing habits of obligated parties supplying fuel to Ontario.

Canola, largely due to the abundance of the Canadian production, has proven to be the natural feedstock choice. Key competitors facing canola oil for use in biodiesel are rendered animal fats (tallow), rendered oils (yellow grease), palm oil (which would be imported as Canada does not produce palm oil), and soybean oil. With the increased production capacity of the canola-based ADM biodiesel plant, nearly all Canadian feedstock is the higher relatively priced canola with better cold weather properties or animal fats and recycled oils that have lower carbon intensity values.

Canola now accounts for 56 percent of the feedstock used in biodiesel production with animal accounting for 14 percent and recycled oils accounting for 30 percent.

While canola use for biodiesel by-itself may be expensive, the co-products from biodiesel production may make economic sense. Co-products include meal to be used in animal feed. There are limits on the profitability of using canola as a feedstock if by-products are part of the everyday production process. For example, off-seed canola may not be a suitable feedstock since this meal may not meet quality standards. Despite these limitations, co-products and the production capacity of the plants (these plants could potentially supply the vast majority of the federal 2 percent biodiesel mandate), combined with provincial biodiesel mandates may make the industry profitable, despite higher commodity prices.

Despite the current growth, future growth of the Canadian biodiesel industry may be limited due to the industry's inability to secure cheap feedstock. Most of the current and forecasted increase in biodiesel comes from canola and strong world demand for vegetable oils may hinder Canada's ability to take advantage of the growing biodiesel market opportunities.

Consumption

The federal mandate pertains to "renewable fuel content" of 2 percent in the distillate pool and is being largely being met by a combination of biodiesel and HVO. Post estimates that Canada will consume 500 million liters of biodiesel/renewable diesel in 2015, a 7 percent decrease from 2014 levels. This drop is attributed to an economic slowdown in the Canadian economy related to low oil prices. Post forecast similar consumption levels for 2016.

The federal government estimate in the development of the regulations that 520 million liters of renewable diesel would be required to meet the federal mandate of 2 percent. Taking into account exemptions and the economic slowdown, consumption levels of biodiesel and renewable diesel suggest

that the mandate in being met. Blend rates are likely slightly higher than federal mandate of 2 percent due significant over-blending in BC which blends up to 20 percent biodiesel to meet environmental GHG reduction. In 2014, Ontario also introduced a biodiesel mandate that can reach up to 4 percent based on GHG emission reduction requirements.

Trade

Exports

Despite full capacity use being able to supply close to 75 percent of the federal mandate, the majority of biodiesel produced in Canada is exported to the United States due to the U.S. biodiesel blenders' tax credit and Renewable Identification Numbers (RINs). U.Ss companies that blend biodiesel with diesel to fulfill their obligation under the Renewable Fuel Standard (RFS) can reduce their tax liability by US$1/gallon of biodiesel blended into the diesel they supply the market. Through contractual arrangements with suppliers (both domestic and foreign) blenders share a portion of this credit with suppliers. RINs have market value and accompany domestic and foreign biodiesel made using EPA-approved pathways and are therefore used by obligated parties to meet their supply requirements under the RFS. In fall of 2011, the United States Environmental Protection Agency (EPA) signed the Canadian Aggregate Approach Petition to approve Canadian feedstocks, including canola, for biodiesel production in the United States. This decision provides secure access for Canadian canola as a sustainable feedstock for U.S. biodiesel markets. As a result, it is likely that there will be more Canadian exports of canola to the United States to meet RFS2, with some canola derived biodiesel returning to Canada. Since 2011, all Canadian biodiesel is RIN eligible.

Depending on market conditions and contractual arrangements between producers and obligated parties, a portion of the value of RINs will be shared with producers thus further incentivizing Canadian shipments to the United States. Both Canadian production and exports to the United States trade have continued under contractual arrangements that limit revenue loss if the tax credit is not reinstated. This credit has expired four times in the past six years, including on Dec. 31, 2014, only to be reinstated retroactively, usually only for the past year. While risk persists, the industry assumption is that the blenders' tax credit will be reinstated retroactively for 2014 and 2015 by December 2015.

The U.S. blenders tax credit has the added trade impact of lowering to some degree the price of U.S. biodiesel delivered to the Canadian market and thus promoting U.S. shipments to Canada. This incentive is maximized for each shipment when B99 is sold because 99 gallons of every 100 gallons will receive this tax credit. However, since this credit is used by U.S. blenders to offset taxes owed, only a portion of the benefit will be passed forward in the marketing chain and thus lowering the landed price of U.S. biodiesel in Canada. By law, RINs attached to exported biodiesel must be retired and thus have no impact on U.S. shipments to Canada.

Post forecasts the same trend in exports to continue into 2015 and 2016. Lower biodiesel production due to higher feedcosts is expected to result in slightly lower export levels in 2015 and 2016 compared to 2014. Year to date trade data (January to June) shows exports are 7 percent lower in 2015 than for the same time period in 2014. Post forecasts biodiesel exports to fall to 295 million liters in 2015, nearly 10 percent below 2014 levels. Similar export levels are forecast for 2016.

Imports

Total imports (biodiesel + HVO) are forecast to fall in 2015 to 480 million liters and remain at similar levels into 2016 due to decreased demand resulting from an economic slowdown related to low oil prices. This is a decrease of 10 percent. The cost of HVO has increased due to increased competition for HVO from the United States (California) so Post forecasts a decrease of import share for HVO compared to U.S. biodiesel. Imports of HVO increased after the implementation of a 4 percent blend mandate in British Columbia in 2011 and then further increased due to the implementation federal renewable content in diesel fuel mandate in 2012. Neste Oil is currently only supplier of HVO to Canada.

V. *Advanced Biofuels*

While Canada is still not a significant producer of advanced biofuels, over the past few years it has been making progress toward beginning full-scale commercial plants. In 2009, Enerkem opened a demonstration biofuels and biochemicals facility; in spring of 2012, this plant began production of cellulosic ethanol via treated wood as feedstock at a 5 million liter capacity.

Enerkem has completed its construction of a 38 million liter, cellulosic ethanol plant in Edmonton, Alberta. Edmonton will provide 100,000 dry metric tons of municipal solid waste to the plant as feedstock. Due to the current lower comparative price for ethanol, Enekem has chosen to produce other more profitable chemicals such as methanol and carbon dioxide.

Future plans for a full-scale, cellulosic ethanol plant in Varennes, Quebec have also been announced. It would be a joint venture of Enerkem and Greenfield Ethanol Inc. and the Varennes plant will use Enerkem's proprietary thermochemical technology to potentially convert non-recyclable waste into 38 million liters of cellulosic ethanol per year.

Nexterra, based in Vancouver, developed energy-from-waste gasification systems for the production of clean, renewable heat and power. The company has completed 6 commercial projects. The typical scale of Nexterra systems range from 2 to 40 MWt(8 to 120 MMBtu/hr) net useable heat for thermal energy systems, or from 2 to 12 MW for power systems. More on their projects can be found at the following website: http://www.nexterra.ca/files/projects.php

Pyrolysis, a technology which heats biomass to temperatures above 350 degrees celsius to produce bio-oil, which can be used for energy or processed further to product extract chemicals, and char, which can be used as a fuel is also being developed in Canada. Two companies are currently engaged in pyrolysis - Ensyn in Ottawa and Dynamotive Energy Systems in Vancouver.

Currently, HVO production in Canada is currently less economic than biodiesel, resulting in less Canadian demand. There are currently no domestic HVO production facilities, and no pending plans to build a commercial-scale facility.

Biogas is also of increasing interest and investment. Much of the work for on biogas is being done at the municipal level and for the most part is at the pilot project level. Two of the three bio-energy projects that received 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 from large scale Alberta hog operations. Highmark Renewables Research also received a significant grant from AVAC Ltd. for a bio-gas feasibility study at a large scale dairy facility. More information on the biogas industry in Canada can be found on the website of the Biogas Association at the following website: http://www.biogasassociation.ca/bioExp/.

VI. Biomass for Heat and Power – Wood Pellets

Wood pellets are a small but important market for the Canadian forest industries. Industrial residues are collected from sawmills and wood manufacturing industries then bound together through compression or with the aid of a binding agent. Supply chain issues, logistics and sustainability issues have been the limiting factors for the Canadian wood pellet industries. Increased storage capacity built at export terminals in Quebec City and Prince Rupert will help improve exports, as will longer term service contracts with the railways.

STATISTICS

Table 7- Wood Pellets (1,000 MT)										
Calendar Year	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Beginning Stocks	70	70	70	71	71	101	148	151	156	151
Production	1,485	1,335	1,300	1,320	1,450	1,521	1,822	1,820	1,820	2,000
Imports	0	0	0	0	0	45	21	23	20	20
Exports	1,390	1,240	1,244	1,225	1,300	1,369	1,640	1,638	1,645	1,725
Consumption	90	95	95	95	120	150	200	200	200	300
Ending Stocks	75	70	31	71	101	148	151	156	151	146
Production Capacity										
Number of Plants		33	33	33	39	42	41	41	39	41
Nameplate Capacity	1,600	2,085	2,083	2,082	2,900	3,175	3,282	3,681	3,400	3,830
Capacity Use (%)	92.8%	64.0%	62.4%	63.4%	50.0%	47.9%	55.5%	49.4%	53.5%	52.2%

Production

In Canada, production is driven by demand from foreign markets, with current production capacity far exceeding domestic demand. The expansion of the wood pellet production capacity in Canada has also exceeded the growth in demand from the export markets. Production capacity growth has been relatively stable since 2011 and the sales have continued to show steady growth which has helped stimulate capacity utilization factors for the industry. Production capacity usage averages approximately 50% .

The pellet industry in Canada has grown rapidly as it tries to position itself to respond to Europe's increased need for biomass to be used as fuels in European heat and power plants as well a meet market demand from South Korea and Japan. The EU has been increasing funding for renewable energy production, including doubling the financial allotment of funds to renewable energy in 2007. In 2004, the EU announced that by 2020, 20 percent of its total energy consumption requirements will be renewable energy sources, greatly higher than the 12.4 percent in 2010.

In 2015, the province of British Columbia accounts for about 57 percent of Canadian production capacity. This is followed by Quebec with 18 percent of national production capacity and Ontario with 7 percent. Total Canadian production capacity is expected to reach 3.830 TMT, an increase of 12 percent over 2015 levels as a result on new production coming on-line in Ontario.

Production in 2015 is estimated to reach 1.820 MMT, production levels similar to those in 2014. Production levels are forecast to rise to 2.0 MMT in 2016 due to increased production capacity coming online and continued steady demand from Europe, as it strives to reach its reach its 2020 energy and climate change goals, and from the United States, the world's largest consumer of wood pellets.

Consumption

Only a small proportion of the production remains in the domestic market for residential heating and power generation - an estimated 150 to 200 TMT. Provincial regulations that are designed to reduce carbon emissions may help substantially increase the domestic consumption of wood pellets in the longer run.

The government of the Northwest Territories has put forth policies that ecourage switching to wood pellets for heating purposes in order to reduce reliance on oil. It is now looking at how the local forests

can be used sustainably to build a regional wood pellet industry that could feed demand.

The government of Ontario also has ambition emissions reduction targets which will lead to increased wood pellet usage for heating and power. Already the fibre mill being converted to pellet production in Ontario has contracted with the Ontario Power Generation (OPG) to supply it with 45 TMT of wood pellets annually.

Trade

Canada is the second largest exporter of wood pellets in 2014, after the United States. Canada also faces competition from Russia. In 2014, Canada exported 1.638 MMT of wood pellets, the same amount that was exported in 2013. The EU, the United States, South Korea, and Japan accounted for 73, 13, 9 and 4 percent of the Canadian wood pellet exports. Year to date trade data (January to June) in 2015 shows exports are at similar levels to where they were for the same period a year ago. Post forecasts that exports may lift slightly in 2015 from 2014 levels and then rise to 1.725 million tons in 2016, a 5 percent increase over 2016 levels. This forecast of increased exports is based on additional production capacity comng on line in 2016, and the fact that Rentech has already contracted with Drax, a UK power company to provide it with 400 TMT of pellets annually for 10 years.

VII. Statistical Notes:

Production: Ethanol and Biodiesel production numbers for 2015, 2016 were developed based on confidential discussions with industry. The numbers for 2014 are accurate as they are derived from program subsidy payments.

Trade: Tariff lines used to calculate for total ethanol imports/exports was only 220720 due to the fact that most under 220710 was for beverage use. Trade lines for fuel ethanol for the year 2012, 2013 and 2014 were 2207201210 (Statistics Canada) and 2207200010 (ethyl alcohol for fuel purposes, US Census) as well as 2207109010 (also for fuel, Statistics Canada) and 2207106010 (US Census, also fuel). Fuel and total industrial ethanol imports could not be separated out pre-2011. Trade for fuel pre-2011 was estimated based on provincial mandates, domestic consumption, and the fact that traditionally Canada has been a net exporter of industrial. For biodiesel, trade is harmonized under 3826 since 2012. Trade for wood pellets is harmonized under 4401.31 since 2012.

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