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Biofuels Annual

2017

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Report Highlights:

Higher rates of discretionary blending supported higher Canadian imports of U.S. fuel ethanol in 2016 and 2017. Federal and provincial-level renewable fuels programs have continued to support biofuels consumption across Canada. Canadian federal government plans to introduce carbon intensity benchmarks and require all provinces and territories to have a carbon pricing plan would expand consumption of renewable energy and biofuels.

Keywords: CA17055, Canada, Biofuels, Ethanol, Biodiesel

Post: Ottawa

I. Executive Summary

FAS/Ottawa estimates Canadian annual fuel ethanol production edged up one percent to 1,740 million liters in calendar year 2016, and forecasts 3 percent growth in 2017, reaching 1,790 million liters. Production growth has been largely attributed to a change in feedstocks at one facility and increased capacity at two ethanol facilities.

FAS/Ottawa anticipates total Canadian ethanol nameplate capacity will reach 1,970 million liters in 2018, when additional capacity is expected to come online. Canadian federal blending requirements in excess of 2,000 million liters of fuel grade ethanol continued to outstrip Canadian fuel ethanol production in 2016, sustaining imports of 1,103 million liters.

Though most Canadian ethanol is produced from corn and wheat, Enerkem began commercial-scale cellulosic ethanol production from wood waste and municipal solid waste in Edmonton in 2017.

Environment and Climate Change Canada (ECCC) expects to publish national production data for the first time for calendar years 2013 to 2016 later in 2018. While data on movement of ethanol and biodiesel across the Canadian border are generally robust, the unavailability of official production and consumption data for biodiesel in Canada has compounded the difficulty of estimating national production and consumption levels. Ahead of ECCC's data release, FAS/Ottawa has temporarily suspended its reporting of biodiesel production and consumption.

Though Canadian biodiesel production capacity exceeds provincial and federal blending mandate requirements, Canada imported significant biodiesel volumes in 2016 as the majority of Canadian biodiesel was exported to the United States to take advantage of U.S. renewable fuel programs. Canola, animal fat, and recycled oils remained the primary biodiesel feedstocks.

While the Canadian biofuels industry had received support from production and consumption subsidies, provincial subsidies have sunset and federal production subsidies ended on March 31, 2017. However, Canadian biofuels continue to benefit from provincial-level volumetric requirements stretching from British Columbia to Ontario, which range from 5 to 8.5 percent for ethanol and from 2 to 4 percent for renewable content in diesel. Quebec's Sustainable Development Action Plan would enact the province's first-ever volumetric requirements on renewables, starting at 5 percent for gasoline and 2 percent for diesel, by 2020.

On December 13, 2017, the federal government released its [Regulatory Framework on the Clean Fuel Standard](#), moving Canada away from volumetric requirements and towards a carbon intensity approach. Volumetric requirements under the current [Renewable Fuels Regulations](#) will remain in force until ECCC clarifies how Canada will transition to carbon intensity benchmarks.

In October 2016, the federal government announced a [Pan-Canadian Approach to Pricing Carbon Pollution](#), which would require all provinces and territories to have some form of carbon pricing plan in place by 2018. On January 1, 2019, the federal government will introduce its own [carbon pricing system](#) in provinces that do not design their own system or elements of the backstop in provinces where the system does not fully meet its criteria.

Following [British Columbia's](#) (BC) renewable and low-carbon fuels program as well as the [Quebec](#) cap-and-trade carbon exchange, other provincial initiatives are underway to create carbon markets and establish Greenhouse Gas (GHG) emissions reduction targets. In 2017, [Ontario](#) held its first auction for carbon allowances, while [Alberta](#) began applying a levy of \$20 CAD per ton on fossil fuel consumption.

II. Policy and Programs

Clean Fuel Standard

In February 2017, Environment and Climate Change Canada (ECCC)¹, issued a [discussion paper](#) explaining its intention to consult with provinces, territories, stakeholders as well as Indigenous Peoples on a national regulation to reduce Canada's GHG emissions through increased use of lower carbon fuels and alternative technologies.

On December 13, 2017, the federal government announced its [Regulatory Framework on the Clean Fuel Standard](#) (CFS), which would move Canadian biofuels policy towards a carbon intensity approach and end the current volumetric requirements approach. Under the proposed CFS, separate carbon intensity requirements would be established for subsets of fuels in the following sectors: transportation, building requirements, and industry. The proposed CFS will not differentiate between crude oil types that are produced domestically or imported. The federal government will maintain national blending mandates in the short-term, establishing an 'expiration date' for the volumetric requirements through consultations with stakeholders.

The federal government continues to consult on the CFS, expecting publication of proposed regulations in Canada Gazette, *Part I* by mid-2018 with publication of final regulations in *Part II* by 2019.² See GAIN Report [CA17047](#) for additional information on the CFS.

Renewable Fuel Requirements

From 2006 through 2010, BC, Alberta, Saskatchewan, Manitoba and Ontario established a blending requirement of 5 to 8.5 percent for ethanol in gasoline and 2 to 4 percent for renewable content in diesel.³ Federal use mandates followed thereafter, and, since December 2010, federal regulations have required fuel producers and importers to have an average ethanol content of at least 5 percent based on the volume of gasoline produced or imported. Since July 2011, federal regulations have required fuel producers and importers to have at least 2 percent, on average, renewable content based on the volume of diesel fuel and heating distillate oil that they produce or import. The current federal [Renewable Fuels Regulations](#) include a trading system and administrative, compliance, and enforcement provisions such as recordkeeping and reporting.

¹ ECCC is the department of the government of Canada with responsibility for coordinating environmental policies and programs as well as preserving and enhancing the natural environment and renewable resources.

² Proposed regulations are published in Canada Gazette, *Part I* for public comment. Final regulations are published in Canada Gazette, *Part II* after they have been enacted. New laws are published in Canada Gazette, *Part III* after the laws have received Royal Assent.

³ Biodiesel is the primary renewable fuel blended with diesel, but hydro-treated vegetable oil (HVO) renewable diesel is also used in British Columbia and Ontario.

Table 1: 2017 Provincial Blend Mandates

Province	Ethanol Blend Mandate for Gasoline	Renewable 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	4 percent

Ontario

Ontario is the most populous Canadian province and leads the country in gasoline, and often diesel, consumption. Ontario's [Ethanol in Gasoline](#) regulation came into effect in 2007 and requires, on average, a minimum of 5 percent renewable content in gasoline. A [November 2017 proposal](#) would raise the floor to 10 percent and require that ethanol used for compliance emit significantly fewer (e.g., 35 percent) GHG emissions on a lifecycle basis than petroleum gasoline starting in 2020. See GAIN Report [CA17045](#) for additional information on Ontario's ethanol proposal.

Ontario's 2014 [Greener Diesel Regulation](#) was phased in from 2014 to 2017. The regulation requires a minimum renewable content in diesel and that the renewable content has a minimum percent reduction in lifecycle GHG intensity compared to standard petroleum diesel. From 2017 onward, diesel fuel in Ontario must have 4 percent minimum renewable content and the renewable content must have at least a 70 percent reduction in lifecycle GHG intensity.

Quebec

Though Quebec is the second largest market for gasoline and third largest market for diesel, it does not have a renewable fuels requirement for transport fuels. However, in June 2017, the province released a [2017-2020 Sustainable Development Action Plan](#), which called for regulations establishing the province's first-ever renewable fuels blending requirements starting at 5 percent for gasoline and 2 percent for diesel. Many details remain to be announced, including the commencement date and whether food and feed-based biofuels could be excluded, but Quebec has publically committed to enacting volumetric requirements by 2020.

Alberta

Alberta's 2010 [Renewable Fuels Standard](#) requires an average of 5 percent renewable alcohol in gasoline and 2 per cent renewable diesel in diesel fuel sold in Alberta. Alberta's standard requires that renewable fuels must demonstrate at least 25 percent fewer GHG emissions than the equivalent petroleum fuel. Alberta's [Climate Change and Emissions Management Act](#) requires a 5 percent reduction in gasoline vehicle GHG emissions below 1990 levels by 2020.

British Columbia

BC's 2008 [Greenhouse Gas Reduction \(Renewable & Low Carbon Fuel Requirements\) Act](#) requires minimum renewable fuel content of 5 percent renewable for gasoline and 4 percent for diesel. These requirements apply to all fuels used for transportation in British Columbia with the exception of fuel used by aircraft or for military operations.

In addition to volumetric requirements, BC also has a Low Carbon Fuel Standard (LCFS), which maintains that fuel suppliers must progressively decrease the average life-cycle carbon intensity of their fuels to achieve a 10 percent reduction in 2020 relative to 2010. On December 1, 2017, the province began [consulting](#) on carbon intensity target feasibility, including the potential to require a 15 to 20 percent total reduction in carbon intensity of transportation fuels by 2030.

Pan-Canadian Framework on Clean Growth and Climate Change

In addition to the CFS, the federal government has released a [Pan-Canadian Framework on Clean Growth and Climate Change](#), which includes a federal carbon pricing framework. The [Pan-Canadian Approach to Pricing Carbon Pollution](#) was announced October 3, 2016.

The pricing strategy would require all provinces and territories to have some form of carbon pricing plan in place by 2018. On January 1, 2019, the federal government will introduce its own [carbon pricing system](#) (the backstop) in provinces that do not design their own system or elements of the backstop in provinces where the system does not fully meet its criteria.

Provincial Carbon Pricing

Prior to the announcement of the federal carbon pricing framework, Canada's four largest provinces (BC, Alberta, Quebec and Ontario) already had carbon pricing in place that would meet the federal benchmark. As of February 2018, [Manitoba](#) and [Nova Scotia](#) were developing their own carbon pricing mechanisms to meet the federal benchmark. The remaining provinces, with the exception of Saskatchewan, have suggested joining the federal pricing system.

In 2008, BC introduced a carbon tax on the purchase and use of fuels. The tax covers approximately 70 percent of total GHG emissions in BC. Carbon tax rates started at \$10 CAD per ton of carbon dioxide equivalent (CO₂e) emissions in 2008, increasing by \$5 CAD per ton each year until reaching the current rate of \$30 CAD per ton of CO₂e emissions in 2012.

Alberta began applying a levy of \$20 CAD per ton on fossil fuel consumption on January 1, 2017, and will raise the levy to \$30 CAD per ton in 2018. This levy, implemented under the [Climate Leadership Act](#), acts as a carbon tax on fossil fuels and exempts biofuels. FAS/Ottawa is currently unaware of any studies that assess the impact the levy is expected to have on increased use of biofuels. All biofuels sold in Alberta must demonstrate at least 25 percent fewer greenhouse gas emissions than the equivalent petroleum fuel.

Ontario passed legislation introducing a [cap-and-trade system](#) in May 2016 and held its first carbon allowance auction in March 2017. The province intends to [link](#) its system with carbon markets in

California and Quebec in 2018. The first joint auction with all three jurisdictions will be February 21, 2018.

Québec passed legislation introducing a cap-and-trade system (excluding transport biofuels) in 2012 and held its first carbon allowance [auction](#) in December 2013. The first joint California-Quebec carbon allowance [auction](#) was held in November 2014. Emission units not allocated free of charge are auctioned off by the government four times a year. A minimum price of \$10.75 CAD was set for 2013, which is scheduled to increase at a rate of 5 percent plus inflation every year until 2020. For joint auctions with California, the minimum price is set by retaining the higher of the two system's minimum prices at the exchange rate prevailing at the time of the auction.

Other Federal and Provincial Initiatives

The provinces and federal government have several initiatives in place that could encourage increased biofuel production and/or consumption.

In June 2017, the federal government announced a [Low Carbon Economy Fund](#) of \$2 billion CAD to support projects that will generate clean growth and reduce GHG emissions towards meeting or exceeding commitments under the Paris Agreement. The fund will be split into two parts:

1. A Low Carbon Economy Leadership Fund that will provide \$1.4 billion CAD to provinces and territories that have adopted the Pan-Canadian Framework on Clean Growth and Climate Change to help them deliver on “leadership commitments” to reduce GHG emissions;
2. \$600 million CAD for a “Low Carbon Economy Challenge” and for implementing the Pan-Canadian Framework on Clean Growth and Climate Change. The Low Carbon Economy Challenge was expected to launch in the fall of 2017, though no further details on the challenge have been announced.

On August 29, 2017, Ontario opened a [Low Carbon Innovation Fund](#) (LCIF) of \$25.8 million CAD to finance projects that would help reduce GHG emissions. The Low Carbon Innovation Fund is part of Ontario's Climate Change Action Plan and is funded by proceeds from the province's carbon market. Companies, entrepreneurs and eligible universities and colleges may apply for funding to create and commercialize new, globally competitive, low-carbon technologies that would help Ontario meet its GHG emissions reductions targets. The fund aims to support technologies in areas such as: alternative energy generation and conservation, new biofuels or bioproducts, next-generation transportation and novel carbon capture and usage technologies.

Alberta facilities that emit more than 100,000 tons of carbon dioxide equivalent (CO₂e) per year, including electricity producers, were subject to the [Specified Gas Emitters Regulation](#) (SGER) from 2007 through 2017, and were required to reduce their baseline emissions intensity from July 1, 2007 by up to 20 percent in each compliance period. From January 1, 2018, facility-specific SGER targets have been replaced by an output-based allocation approach using product-level standards under the [Carbon Competitiveness Incentive \(CCI\) Regulation](#). This approach aims to incentivize deployment of best-in-class technology in each sector, support investment, drive emissions reductions and maintain industry competitiveness.

In December 2017, Alberta announced its [Climate Leadership Plan](#), which intends to:

- Phase out pollution from coal-generated electricity by 2030 by introducing transition payments to owners of six coal units;
- Triple renewable energy to supply 30 percent of generation by 2030, in part through an extension of the [Bioenergy Producer Program](#) (discussed below);
- Reduce emissions from the oil and gas sector;
- Create [Energy Efficiency Alberta](#) to deliver cost saving programs; and
- Implement a province- wide price on carbon.

The plan is expected to be funded over the next three years by \$5.4 billion CAD in gross carbon pricing revenue.

Alberta’s existing [Bioenergy Producer Program was extended](#), with a revised, limited scope through March 31, 2020. The \$63 million CAD program will provide grants to dedicated biofuel-producing facilities, including:

- liquid biofuels, such as biodiesel, ethanol and pyrolysis oil;
- biogas electricity production from farm-based anaerobic digesters;
- electricity produced from woody biomass.

Some research and development funding is also available for biofuels under the \$225 million CAD innovation stream in two program areas: [Emissions Reductions Alberta](#) (\$80 million CAD) and [Climate Change Innovation and Technology Framework](#) (\$145 million CAD).

On October 26, 2016, Quebec became the first province in Canada to introduce a “[zero emission vehicle standard](#).” by adopting a bill to encourage automakers to improve their zero-emission vehicle (ZEV) offer. The ZEV mandate is an approach developed in the United States that imposes penalties on automakers that do not sell enough electric vehicles. While Ontario and British Columbia encourage ZEV ownership by offering financial incentives, Quebec will place the onus on vehicle manufacturers by requiring them to meet ZEV sales targets. Now that the bill has been adopted, the process of adopting the legislation has begun. Mandatory sales reporting by manufacturers is expected to begin when the legislation is adopted, likely in 2018.

III. Gasoline and Diesel Markets

Calendar Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018(f)
Gasoline Total	42,319	44,186	44,555	43,065	44,009	45,355	44,933	46,920	47,018	47,300
Diesel Total	26,001	28,516	30,030	28,179	29,464	29,987	29,307	28,894	31,165	31,200
On-road	15,800	16,823	17,339	17,070	17,495	17,909	17,292	17,048	18,400	18,500
Jet Fuel Total	5,831	6,089	7,480	6,424	6,657	6,366	7,305	7,460	8,089	8,100
Total Fuel Markets	89,951	95,615	99,403	94,738	97,624	99,618	98,837	100,322	104,672	105,100

Source: Statistics Canada, CANSIM, Table [134-0004](#); FAS/Ottawa

Long-term gasoline use has long been expected to decrease due to improved fuel economy and lifestyle changes. However, lower oil prices and higher-than-expected sales of large vehicles due to lower fuel prices have contributed to increased consumption since 2015.

IV. Ethanol

Ethanol Used as Fuel and Other Industrial Chemicals (Million Liters)									
Calendar Year	2010	2011	2012	2013	2014	2015	2016	2017(e)	2018(f)
Beginning Stocks	108	128	127	130	131	131	131	131	131
Fuel Begin Stocks	108	128	127	130	131	131	131	131	131
Production	1,530	1,790	1,780	1,815	1,820	1,820	1,860	1,890	1,990
Fuel Production	1,445	1,700	1,695	1,730	1,730	1,725	1,740	1,790	1,880
Imports	449	983	1,062	1,086	1,167	1,231	1,187	1,256	1,250
Fuel Imports	11	450	805	1,079	1,139	1,088	1,103	1,216	1,130
Exports	94	77	54	58	63	68	76	80	90
Fuel Exports	0	0	0	0	0	0	0	0	0
Consumption	1,865	2,697	2,785	2,842	2,924	2,983	2,971	3,066	3,150
Fuel Consumption	1,436	2,151	2,497	2,808	2,869	2,813	2,843	3,006	3,010
Ending Stocks	128	127	130	131	131	131	131	131	131
Fuel Ending Stocks	128	127	130	131	131	131	131	131	131
Total BalanceCheck	0	0	0	0	0	0	0	0	0
Fuel BalanceCheck	0	0	0	0	0	0	0	0	0
Production Capacity									
Number of Refineries	15	15	14	15	15	15	14	14	14
Nameplate Capacity	1,429	1,818	1,815	1,760	1,800	1,800	1,750	1,872	1,970
Capacity Use (%)	101%	94%	93%	98%	96%	96%	99%	96%	95%
Co-product Production (1,000 MT)									
DDGs	980	1,220	1,075	1,100	1,100	1,100	1,100	1,100	1,100
WDG	575	550	635	650	650	650	425	425	425
Corn Oil	2	2	3	6	6	6	10	10	10
Feedstock Use for Fuel (1,000 MT)									
Corn	2,800	3,201	3,285	3,200	3,250	3,375	3,350	3,375	3,380
Wheat	770	970	850	1,000	1,000	1,000	875	900	925
Market Penetration (Million Liters)									
Fuel Ethanol	1,436	2,151	2,497	2,808	2,869	2,813	2,843	3,006	3,010
Gasoline	44,186	44,555	43,065	44,009	45,355	44,933	46,920	47,018	47,300
Blend Rate (%)	3.2%	4.8%	5.8%	6.4%	6.3%	6.3%	6.1%	6.4%	6.4%

See 'Notes on Statistical Data,' page 14.

Consumption

In Canada, the economics of blending will continue to direct discretionary blend levels. When the price of gasoline is sufficiently high, and where blending facilities exist, higher levels of discretionary blending will occur. In the case of ethanol, when North American ethanol prices are relatively competitive, ethanol has typically been blended at 10 percent where blending facilities exist and at zero percent in locations that do not have blending facilities.

A federal use mandate of 5 percent ethanol blended into the gasoline supply required an estimated 2,346 million liters of ethanol in 2016; at 2,843 million liters, Canadian fuel ethanol utilization exceeded that. However, for the purposes of the mandate, compliance units can be carried forward into a future compliance period, carried back for use in a previous compliance period, or cancelled if required to do so.

FAS/Ottawa data shows relatively stable fuel ethanol consumption growth from 2013 through 2017 (forecasted), climbing seven percent over that period. Recent upward consumption trends support FAS/Ottawa's 2018 consumption forecast of 3,010 million liters in 2018, holding the blend level at 6.4 percent.

Production

Fuel ethanol production has been nearly static since 2011, edging up from 1,700 million liters in 2011 to 1,790 million liters in 2017 (forecasted), as capacity has remained nearly unchanged and plants have operated at or near full capacity. FAS/Ottawa expects fuel ethanol production to grow to 1,880 million liters in 2018 on limited capacity expansion projects and facilities continuing to operate at or near capacity.

Fuel ethanol production increased one percent in 2016 to 1,740 million, driven up by higher oil prices and lower feedstock costs early in the year.

Nameplate production capacity fell from 1,800 million liters per year in 2015 to 1,750 million liters in 2016, as one plant closed in 2016. In 2017, capacity increased to 1,872 million liters due to increased capacity from capital investment at IGPC Ethanol Inc. and Kawartha Ethanol Inc.

In 2017, IGPC Ethanol Inc. launched a \$120 million CAD expansion of its Ontario ethanol plant. The proposed increase would more than double capacity from 178 million liters per year to 378 million liters per year, which would make the facility Canada's second largest. The expansion is expected to come online in November 2018. Media [reported](#) that the expanded plant could consume 2,500 metric tons (MT) of locally-produced corn per day.

Greenfield Global [announced](#) in August 2017 that it has commenced a feasibility study to significantly expand operations for sustainable biofuel production at its bio-refinery in Varennes, Quebec. The expansion could increase the facility's annual ethanol production capacity from 175 million liters per year to 300 million. Still in the assessment stage, this potential increase is not included in FAS/Ottawa's capacity forecasts. The feasibility study will also evaluate the adaptation of emerging advanced biofuels technologies using non-traditional feedstocks and processes, including cellulosic ethanol, renewable diesel, and renewable natural gas.

Feedstock choice for ethanol plants has largely been driven by differences in geography and agronomy. Wheat is used in Alberta and Saskatchewan, wheat and corn in Manitoba, and corn in Ontario and Quebec. 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 could increase. There has also been increasing research into wheat varieties for industrial uses. Wheat with characteristics tailored to the needs of the bioethanol industry would consist of high-starch, low-protein varieties.

In 2016, 4.225 million MT of feedstocks were purchased by the ethanol industry. Between 2014 to 2016, two facilities switched feedstocks from wheat to corn in order to increase throughputs (the higher starch content in corn provides a greater ethanol yield) and due to better economics. FAS/Ottawa estimated that 78 percent of Canadian ethanol production was derived from corn and 22 percent from wheat in 2014. By 2016, FAS/Ottawa estimates that corn contributed to 81 percent of ethanol production, with wheat falling to 19 percent. FAS/Ottawa anticipates that the corn/wheat split was comparable in 2017 and will remain comparable in 2018 due to the location of plants in/around major corn producing regions.

Production of wet distillers grains (WDG), a co-product of ethanol, fell from 0.65 million metric tons in 2015 to 0.425 million metric tons in 2016, as one facility installed a drier. Only one third of the change in WDG is expected to show up in distiller's dried grains (DDG), because DDG have less moisture content and therefore less weight. Further, corn produces less DDG than wheat, so the increase in corn and decrease in wheat utilization in 2016 reduced DDG production. Rounding the data results in no change in the production of DDG in 2016. Assuming all things being equal, levels of co-product production are expected to remain the same in 2017 and 2018.

Corn oil production, another ethanol co-product in Canada, increased slightly in 2016, but has not followed the trend in the United States due in large part to the fact that Canada's [Feeds Regulations](#) require that DDG have a minimum amount of energy content that requires more oil remain in Canadian DDG. Guidance on these regulations can be found [here](#).

Trade

Canada does not have sufficient ethanol production capacity to meet federal and provincial mandates and has imported close to 40 percent of its consumption since 2013, which has remained above the minimum federal requirement. On average, the United States supplies 98 percent of Canada's ethanol imports. As Canada imports significant volumes of fuel ethanol to meet the federal blend mandate, there are generally no exportable supplies.

Canada collects a \$0.0492 CAD per liter tariff on denatured ethanol imported from most favored nation (MFN) status countries under the 2207.20 HS line, including Brazilian denatured ethanol. Products imported under 2207.20 from the United States, the European Union and other free trade agreement partners enter Canada duty free. Undenatured ethanol imported under 2207.10 from all sources enter Canada duty free.

Canada gained tariff-free access to the European Union (EU) bioethanol market in September 2017 when the Comprehensive Economic Trade Agreement (CETA) was provisionally enforced, but current Canadian bioethanol carbon intensity levels are such that a significant amount of Canadian product cannot compete in the EU market. The EU's 2009 [Renewable Energy Directive](#) (RED), Article 17 states:

The greenhouse gas emission saving from the use of biofuels and bioliquids taken into account for the purposes referred to in paragraph 1 shall be at least 60 % for biofuels and bioliquids produced in installations starting operation after 5 October 2015. An installation shall be considered to be in operation if the physical production of biofuels or bioliquids has taken place.

In the case of installations that were in operation on or before 5 October 2015, for the purposes referred to in paragraph 1, biofuels and bioliquids shall achieve a greenhouse gas emission saving of at least 35 percent until 31 December 2017 and at least 50 percent from 1 January 2018.

Biofuels consumed in the EU, both produced domestically and imported, must meet these and other sustainability requirements in order to be counted against renewable energy obligations or to be eligible for financial support under the RED. While the majority of Canadian bioethanol from older plants achieves GHG savings of about 45 percent using the GHGenius 4.03 model, some newer Canadian facilities exceed the 50 percent mark. However, FAS/Ottawa is unaware of any evaluations of Canadian bioethanol using the EU Biograce model, which, unlike GHGenius 4.03, incorporates indirect land-use change.

V. Biodiesel / Renewable Diesel

Biodiesel & Renewable Diesel (HVO), Million Liters									
Calendar Year	2010	2011	2012	2013	2014	2015	2016	2017(e)	2018(f)
Biodiesel (Million Liters)									
Beginning Stocks	10	19	19	4	20	n.a.	n.a.	n.a.	n.a.
Production	115	120	100	140	n.a.	n.a.	n.a.	n.a.	n.a.
Imports	100	170	261	307	269	286	267	307	290
Exports	110	80	103	156	327	267	464	350	350
Consumption	96	210	274	275	n.a.	n.a.	n.a.	n.a.	n.a.
Ending Stocks	19	19	4	20	n.a.	n.a.	n.a.	n.a.	n.a.
BalanceCheck	0	0	0	0	0	0	0	0	0
Biodiesel Production Capacity (Million Liters)									
Number of Plants	13	9	8	8	8	9	9	9	10
Nameplate Capacity	258	225	223	400	400	400	425	591	641
Capacity Use (%)	45%	53%	45%	35%	n.a.	n.a.	n.a.	n.a.	n.a.
Feedstock Use for Biodiesel (1,000 MT)									
Canola Oil	3	7	7	35	n.a.	n.a.	n.a.	n.a.	n.a.
Animal Fat	78	63	26	30	n.a.	n.a.	n.a.	n.a.	n.a.
Used Cooking Oil	27	46	65	65	n.a.	n.a.	n.a.	n.a.	n.a.
Soybean	1	1	0	1	n.a.	n.a.	n.a.	n.a.	n.a.
Renewable Diesel (HVO) (Million Liters)									
Imports	130	235	178	273	254	250	240	250	250
Consumption	130	235	178	273	254	250	240	250	250
Biodiesel + Renewable Diesel (HVO)									
Beginning Stocks	10	19	19	4	20	n.a.	n.a.	n.a.	n.a.
Production	115	120	100	140	n.a.	n.a.	n.a.	n.a.	n.a.
Imports	230	405	440	580	524	536	507	557	540
Exports	110	80	103	156	327	267	464	350	350
Consumption	226	445	452	548	n.a.	n.a.	n.a.	n.a.	n.a.
Ending Stocks	19	19	4	20	n.a.	n.a.	n.a.	n.a.	n.a.
BalanceCheck	0	0	0	0	0	0	0	0	0
Market Penetration, Biodiesel + Renewable Diesel (HVO) (Million Liters)									
Biodiesel+HVO, on-road use	126	275	350	350	n.a.	n.a.	n.a.	n.a.	n.a.
Diesel, on-road use	16,823	17,339	17,070	17,495	17,909	17,292	17,048	17,100	17,100
Blend Rate (%), on-road	0.7%	1.6%	2.1%	2.0%	n.a.	n.a.	n.a.	n.a.	n.a.
Diesel, total use	28,516	30,030	28,179	29,464	29,987	29,307	28,894	29,000	29,000

See 'Notes on Statistical Data,' page 14.

Note: ECCC expects to publish national production data for the first time for calendar years 2013 to 2016 later in 2018. While data on movement of ethanol and biodiesel across the Canadian border are generally robust, the unavailability of official production and consumption data for biodiesel in Canada has compounded the difficulty of estimating national production and consumption levels. Ahead of the release of ECCC data, FAS/Ottawa is withholding estimates of Canadian biodiesel production, consumption, feedstock use and stocks from 2014 onward. FAS/Ottawa anticipates providing a full balance in its 2019 Biofuels Annual Report.

Canadian biodiesel production met provincial and federal blend mandates approximately five ago. The national market for biodiesel / renewable diesel will evolve further as provincial markets develop and implement clean fuel standards, a process already underway in some provinces. In recent years, much of Canadian biodiesel production has been exported to the United States in response to U.S. biomass-based diesel tax support, RIN support, and EPA rule-making for obligated volumes under the U.S. Renewable Fuels Standard (RFS), which continues to grow U.S. biodiesel demand. Canada then imports sufficient volumes of biodiesel and renewable diesel to meet Canadian blending requirements.

Industry sources indicate that Canadian biofuel storage capacity is limited, precluding producers or blenders from holding large biofuel stocks.

Production Capacity

Canadian biodiesel production capacity has remained well below domestic demand since 2011, and there was no commercial production of renewable diesel in Canada in 2017.

In 2017, there were nine commercial biodiesel production facilities in operation, ranging in capacity from 200,000 to 265 million liters per year, with total national biodiesel production capacity of 591 million liters per year.

Later in 2018, national capacity is expected to increase to 641 million liters per year as BIOX Corp. increases the production capacity of its Canadian operations to 117 million liters per year (18 percent of national biodiesel capacity). The additional 50 million liters a year would come from the company's recent purchase of a shuttered biodiesel facility in Sombra, Ontario.

Trade

In 2016, Canadian biodiesel exports increased 74 percent to 464 million liters as Canadian exporters benefitted from RINs, the U.S federal biodiesel tax credit before it expired at the end of 2016, and EPA rulings raising the obligations which biodiesel can fulfill. Most of the volume was exported under the HS code 3826.00 (Biodiesel and mixtures thereof, not containing or containing less than 70 percent by weight of petroleum oils/oils obtained from bituminous materials) and are assumed to have been pure biodiesel. However, a smaller volume was exported under code 2710.20 (petroleum oils containing up to 30 percent biodiesel by volume).

In 2017, biodiesel exports fell from the record 464 million liters to 350 million liters in response to reduced U.S. consumption. Despite Canada's ability to satisfy provincial and federally mandated blending requirements with domestically produced Canadian biodiesel, the majority of biodiesel produced in Canada continues to be exported to the United States due to the U.S. biodiesel blenders' tax credit and [Renewable Identification Numbers](#) (RINs), both of which benefit Canadian producers who export to the United States.

A large portion of the \$1 USD per gallon blenders' federal tax credit for biodiesel (hereafter blenders' credit) is captured in the buyer-seller contract, creating a benefit that Canadian biodiesel producers cannot capture in the Canadian market. The blenders' credit, which applied to all biomass-based diesel (both diesel and renewable diesel), both domestically produced or imported, expired at the end of 2016.

In February 2018, U.S. Congress approved a retroactive restoration of the blenders' credit for 2017. The bill did not include a provision for 2018 and future years.

The U.S. House of Representatives and the Senate introduced bills to reinstate a biodiesel credit that would limit the benefit to U.S. biofuel producers; however, as with similar bills put forward in the past, they were unsuccessful. New legislation excluding foreign-sourced biomass-based diesel from the tax credit, would severely reduce, if not halt, Canadian exports of biodiesel to the United States. Such a policy shift would be expected to push more Canadian biodiesel into Canadian distribution channels and limit Canadian imports of biodiesel.

FAS/Ottawa's 2018 biodiesel export forecast is based on a continuation of the current policy environment, in which there is no U.S. federal tax credit for biodiesel produced in 2018.

RINs provide another incentive for Canadian biodiesel exports to the United States. RINs accompany domestic and foreign biodiesel made using EPA-approved pathways with a minimum GHG reduction of 50 percent and are used to meet renewable volume obligations under the U.S. [Renewable Fuel Standard](#) (RFS). Depending on market conditions and contractual arrangements between producers and obligated parties, a portion of the value of RINs may be shared with producers, which further increases Canadian biodiesel producers' revenue.

Exporting well over half of the biodiesel it produces each year, Canada imports biodiesel and renewable diesel (HVO) in order to meet Canadian renewable content requirements. The United States supplies most of Canada's imported biodiesel, as import prices reflect U.S. production efficiencies as well as discounts from the U.S. federal tax credit. Since 2012, the United States (biodiesel and, in recent years, renewable diesel) and Singapore (renewable diesel) have supplied between 85 and 100 percent of Canada's total imports of renewable fuels for diesel blending, with the European Union making up the difference.

Canada does not collect a duty on biofuels imported under the 2710.20 or 3826.00 HS lines.

While Canadian HVO imports reached a record of 273 million liters in 2013, import volumes appear to have receded since then as Canada has competed with European and U.S. buyers for limited quantities of HVO produced in Singapore and Europe. Government sources confirm that Canada has imported HVO from Singapore, the Netherlands and Finland. Industry sources indicate that Canada has imported HVO from the United States as well.

VI. Advanced Biofuels

Though Canada's production of biofuels using advanced technology platforms is limited, federal and provincial policy incentives favoring lower carbon intensity biofuels would provide additional support to advanced biofuels production in Canada. Two Canadian firms have achieved, or will soon achieve, commercial-scale production. Enerkem makes cellulosic methanol and ethanol (which can be used as fuel or other industrial chemicals) from syngas by recycling carbon in municipal solid waste (MSW). Ensyn uses woody biomass to make biocrude, used as feedstock and co-processed at refineries to produce lower carbon fuels and any number of chemicals or used to produce renewable fuel oil for

heating and cooling) and other specialty chemicals via a process called rapid thermochemical liquification.

In 2003, Enerkem started operating a pilot facility in Sherbrooke, Québec. Later, a demonstration plant making syngas started operations in Westbury, Quebec in 2009, which then began methanol production in 2011 and ethanol production in 2012. The Westbury facility tests new feedstocks, produces syngas, methanol and ethanol, and has an annual methanol production capacity of 5 million liters. In 2014, Enerkem launched the world's first full-scale MSW-to-biofuels and chemicals facility in Edmonton, Alberta. Enerkem's Edmonton plant started with methanol, but with the addition of a methanol-to-ethanol converter unit, the plant began producing ethanol in 2017. The plant has a current maximum annual methanol-ethanol production capacity of 38 million liters.

The Edmonton plant became the first ever MSW-to-cellulosic ethanol plant certified to meet renewable fuel obligations under the U.S. RFS and to generate RINs, having received U.S. EPA pathway approval in 2017. Also in 2017, its ethanol scored the lowest carbon intensity value ever issued by the British Columbia Ministry of Energy and Mines under BC's [Renewable and Low Carbon Fuel Requirements Regulation](#). Enerkem develops partnerships and licensing agreements to build facilities that convert MSW to renewable fuels and chemicals. The company provides fabricated modular equipment and handles assembly on site, and several supported projects are now in development in the United States, Europe and China.

Ensyn Technologies Inc., established in 1991, began its focus on renewable fuels in 2005 with the commissioning of its 70 dry tons/day plant in Renfrew, Ontario which was initially designed to produce renewable fuel and chemicals and then retooled in 2014 to focus on fuel. In 2016, construction began on the Cote Nord Project at Port Cartier, Quebec. A 50/50 joint venture between Ensyn and Arbec Forest Products, the plant uses rapid thermochemical liquification with a capacity to transform forest residues into 40 million liters/year of biocrude. Project commissioning is scheduled for the end of 2017 with offtake focusing initially on U.S. northeast and eastern Canada heating markets and as a renewable feedstock for petroleum refineries for the production of low carbon transport fuels. Rapid thermochemical liquification of biomass wastes is a closed system whereby lignocellulosic materials are heated rapidly in the absence of air causing a breakdown of their polymeric structure to produce low molecular weight liquids.

VII. Notes on Statistical Data

Ethanol Production: Reported production estimates for the years 2015 and 2016 are collected from industry and are unaudited. Data collected by ECCC since 2010 has been submitted by regulated facilities pursuant to the requirements of the Renewable Fuels Regulations under the Canadian Environmental Protection Act. The data published is audited and is subject to ongoing verifications. The limitation of using ECCC data prior to 2013 is that compliance units are used as a proxy for production and thus do not necessarily represent production in any given year, as compliance units can be carried forward into a future compliance period, carried back for use in a previous compliance period, or cancelled if required to do so.

FAS/Ottawa's numbers for 2014 and earlier years are derived from program subsidy payments.

Ethanol Trade: Total trade in ethanol used as both fuel and other industrial chemicals is based on all undenatured codes under 2207.10 (excluding beverage ethanol) plus all denatured codes under 2207.20. Statistics Canada data was cross-checked for accuracy with U.S. customs data. Codes for ethanol used as fuel, both undenatured and denatured, were introduced in 2012 with most trade falling under denatured. Prior to 2012, trade in fuel ethanol is estimated based on plant production data, progress toward meeting provincial mandates, domestic consumption, and the fact that Canada has been a net importer of nonfuel industrial chemical ethanol.

Biodiesel/Renewable Diesel Trade: Biodiesel trade is tracked under code 3826.00, which covers biodiesel blended above 30 percent by volume with fossil diesel and includes pure biodiesel (B100), and the code for petroleum oil containing biodiesel up to and including 30 percent biodiesel by volume (2710.20). All biodiesel in the market balance table is reported as pure biodiesel (B100) or B100 equivalent. We assume all biodiesel traded under 3826.00 is pure B100, and all trade under 2710.20 is B5. Therefore, volumes traded under 2710.20, which have thus far remained relatively small, are multiplied by .05 before they are added directly to 3826.00. Statistics Canada data was cross-checked for accuracy with U.S. customs data.

Canada imports large volumes of hydro-treated renewable diesel, but there is no trade code specific to this product and the few supplying companies do not share sales data. Sources report that renewable diesel has been listed under different codes over time, including even biodiesel although their chemical characteristics are different. Renewable diesel imports are estimated by assuming all imports from Finland, the Netherlands and Singapore under biodiesel code 3826.00 are pure renewable diesel and added to estimates for shipments from the United States. This estimation method is prone to over- and under-counting errors.

Feedstocks: Feedstock use figures are based on information supplied by industry and consistent with known feedstock/biofuel conversion rates.