

USDA Foreign Agricultural Service

GAIN Report

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Required Report - public distribution

Date: 11/14/2018

GAIN Report Number: CH 18041

China - Peoples Republic of

Biofuels Annual

China Biofuels Annual 2018

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Report Highlights:

China's 2018 total ethanol production is forecast to grow on expanding industrial alcohol capacity. 2018 fuel ethanol production is forecast lower on falling capacity utilization. 2018 fuel ethanol imports are forecast up mainly due to arbitrage opportunities for U.S. ethanol. Imports of ethanol to China ceased after additional duties on U.S. ethanol entered into force starting in July 2018.

Biofuels are part of China's long-run strategy to conserve resources, improve air quality, and reduce its dependence on imported fossil fuels. Full implementation of China's E10 target by 2020 faces numerous and significant challenges. Following a partial collapse in 2015, biodiesel demand is recovering incrementally. However, without financial support and prospects for a nationwide blending mandate, China's biodiesel market remains extremely limited subject to lower priced competition from fossil-based diesel.

Post:
Beijing

Executive Summary:

Over the past two decades, through a series of four Five-Year Plans (FYPs), China has transformed itself from producing zero biofuels into the world's fourth largest producer over a decade ago in 2017. Throughout this period, China's policymakers have internally debated about how to manage grain prices, rural welfare, and food security. As a result, China's fuel ethanol policies often reflect the current stocks situation, which fluctuate between long, slow accumulations of massive grain stocks, and relatively rapid drawdowns. When stocks are building, China uses several policy measures to restrict grain processing into ethanol. When stocks are liquidated, China uses several policy measures to promote a rapid expansion of national fuel ethanol production capacity and throughput (See Annex 1). In 2018, several factors support fuel ethanol demand, and a corresponding drawdown in grain stocks, which is already underway.

China is the world's largest energy user, surpassing the United States as the largest crude oil consumer in 2017. In 2000, China's national fleet totaled less than 20 million passenger vehicle. From 2005 to 2015, China's passenger car fleet increased by a factor of ten. In 2018, China has surpassed the United States as the largest car market in the world, including a total of more than 322 million vehicles. China recognizes the strategic value of energy independence. Biofuels offer a means to stretch the economic value and efficiency of imported fuel supplies. Future prospects for China's transportation fuel demand depend on: macroeconomic factors; the adoption rate for NEVs and advanced fuel vehicles; and implementation of China's ambitious new drive to reach a national E10 fuel ethanol target.

From a public and environmental health perspective, biofuels are part of China's long-run strategy to conserve resources, improve air quality, and reduce its dependence on imported fossil fuels. Blending biofuels into petroleum fuels for transportation will support several of the Government of China's initiatives to manage the "urban ills" of traffic, pollution, and public safety concerns. In 2006, China elevated Energy Efficiency and Pollution Abatement as a National Policy, positioning it on par with other key pillars of Chinese domestic policy. Additionally, in 2016 and 2017, China implemented more stringent emissions and efficiency standards for vehicles, and retail gasoline fuel blends. Fuel ethanol is a competitively priced and effective fuel oxygenate, which can contribute towards China's domestic and international commitments to lower air particulates, toxic chemicals, and greenhouse gas emissions. Similar advantages are possible if fossil-based diesel products are blended with biodiesel. However, China does not have a national policy framework for biodiesel use.

Fuel ethanol policies will support China's effort to promote rural and agricultural development in the short- and long-term. In the near-term, fuel ethanol supports President Xi's supply-side and structural reform program. By disposing of the nation's grain stockpile, China will lower fiscal burdens and narrow the relative gap between high domestic prices, and relatively lower global benchmark prices. In the long-term, the adoption of a stable fuel ethanol program will raise farm incomes and improve rural economic development. In

addition to food and feed use, fuel use will bring a third-dimension for China's farmers to market their grain, and over the long-term support corn prices.

Ethanol:

For many industry observers, 2018 is a year to assess the long-term prospects of China's biofuels policies. In 2017 and 2018, the Government of China and several Chinese ethanol producers announced plans to rapidly expand capacity. In September 2017, several Chinese ministries issued a joint directive on the "Expansion of Ethanol Production and Promotion for Transportation Fuel" to achieve nationwide 10 percent ethanol (E10) use by 2020. China is also targeting a national shift in production to cellulosic technology by 2025.

2018 total ethanol production (fuel and other industrial chemicals) is forecast at 9,770 million liters (7.7 million tons), up 559 million liters (441,000 tons) from 2017 on expanding industrial alcohol capacity. 2018 fuel ethanol production is forecast lower at 2,914 million liters (2.3 million tons), down 127 million liters (100,000 tons), due to recent ethanol plant closures. In the short-term, China has abundant grain feedstocks to produce ethanol. However, China's ability to raise national ethanol capacity utilization rates, produce, and distribute sufficient fuel ethanol supplies to accommodate a rapid shift in national consumption from the current 3.7 billion liters (2.9 million tons) to the proposed target to meet national E10 adoption of 18.6 billion liters (14.7 million tons) in 2020 is considered uncertain by most experts.

Although China's goal aims to raise ethanol consumption by nearly five-fold from current levels, China's current environmental and trade policies and underlying economic fundamentals impair large-scale efforts to expand consumption at the targeted pace announced. Permitting issues have hamstrung investment projects to expand new ethanol production and improve overall industry efficiency. The China Petroleum and Chemical Industry Federation (CPCIF) remains skeptical that ethanol will significantly impact China's overall transportation fuels outlook.

2018 fuel ethanol imports are forecast at 700 million liters (552,000 tons), up nearly 692 million liters (546,000 tons) from 2017 as higher tariffs partly offset additional demand due to E10 blending mandates entering into force by several provincial and local governments. Over the first ten months of 2018, trade data indicate that global exports to China reached 659 million liters (520,000 tons). Newly implemented import tariffs on U.S.-origin ethanol have ended an arbitrage opportunity for the largest foreign supplier of ethanol to China.

2018 total fuel ethanol consumption is estimated at 3,670 million liters (2.9 million tons), up 452 million liters (357,000 tons) from 2017 due to new government directives to expand fuel ethanol blending into gasoline supplies. With rising gasoline prices and a target of 10-percent blend use nationwide by 2020, industry sources expect imports will be needed to fill a shortfall in domestic ethanol supplies. However, because the United States is the largest volume supplier at competitive prices, China's additional tariffs on U.S.-origin ethanol limit the volume of China's ethanol imports.

Biodiesel:

Biodiesel producers and consumers do not receive subsidies or government support through a nationwide mandate, or provincial mandates as is the case for fuel ethanol. From 2013 to 2014, as benchmark crude oil prices rose remained above \$100 per barrel, biodiesel demand expanded as a lower-cost substitute. At the time, consumption reached a record 2.1 billion liters (1.8 million tons) evenly supplied by domestic production and imports. Following the oil price collapse of 2014, and with no subsidy supports, biodiesel consumption in China collapsed. As prices slumped, domestic production and imports followed suit. Shanghai's municipal biodiesel B5 program is supporting expanded national biodiesel production and use. In early 2018, demand for discretionary blend use resumed. Soon after energy traders brokered imports of palm oil biodiesel from Indonesia to meet rising demand.

2018 biodiesel production is forecast higher at 1,140 million liters, up 100 million liters (88,000 tons) from 2017, due to greater domestic use and rising exports to the European Union. Imports are forecast to rise to 340 million liters (300,000 tons). Consumption is forecast at 1,130 million liters (1.28 million tons), up 263 million liters from 2017, supported by higher imports

Advanced Biofuels:

In China, fuel ethanol is mainly produced from corn. However, the industry is investing significant resources to transition from corn and cassava feedstock to bio-based cellulosic feedstock, and develop coal- and industrial flue gas-based feedstocks for synthetic methanol and ethanol production.

China began producing commercial-scale cellulosic ethanol in 2013, but also faces the same technological challenges which have limited the expansion of cellulosic ethanol production elsewhere in the world. As a result, China's has not been able to sustain annual cellulosic ethanol production levels above 40 million liters (30,000 tons).

2018 cellulosic ethanol production is forecast at 20 million liters (15,785 tons) as China's major cellulosic projects have been idled, or remain under development. Expanded cellulosic ethanol production will depend on lowering the costs of production relative to crude oil prices, which includes more efficient feedstock handling. Although global benchmark crude oil prices have risen in recent months, current crude oil prices remain less than \$100 per barrel, or less than the economic breakeven point for China's cellulosic ethanol producers. Although nascent, China's projects that convert coal and industrial waste-gas to ethanol (synthetic fuels and non-bio-based) appear to be expanding incrementally.

Acronyms

Chinese Academy of Sciences (CAS)
Carbon Emission Footprint (CEF)
Carbon Emissions Trading System (ETS)
China Association of Automobile Manufacturers (CAAM)
China National Cereals, Oils and Foodstuffs Corporation (COFCO)
China National Offshore Oil Company (CNOOC)
China National Petroleum Corp (CNPC)
China National Petroleum Corp, Publicly listed-arm (PetroChina)
China National United Oil Corp, CNPC Trading-arm (Chinaoil)
China Petroleum and Chemical Corporation (Sinopec)
China Petroleum and Chemical Corporation, Trading-arm (Unipecc)
Chinese People's Political Consultative Conference (CPPCC)
Electric Vehicle (EV)
Ethyl Tert-Butyl Ether (ETBE)
Five-Year Plan (FYP)
General Administration of China Customs (GACC)
Greenhouse Gas (GHG)
Ministry of Ecology and Environment (MEE)
Ministry of Environmental Protection (MEP)
Ministry of Finance (MOF)
Ministry of Public Security (MPS)
National Development and Reform Commission (NDRC)
National Energy Administration (NEA)
National People's Congress (NPC)
New Energy Vehicles (NEV)
Particulate Matter (PM)
Renminbi (RMB)
State Council Tariff Committee (SCTC)
Used Cooking Oil (UCO)

I. Policy and Programs

Biofuels are part of China's long-run strategic plan to protect the environment, conserve resources, and reduce dependence on imported energy. With ambitious emissions targets and policies, China's ethanol programs support several national initiatives to manage air pollution. For more details, see GAIN reports [CH13040](#), [CH14038](#), [CH15030](#), [CH16058](#), and [CH16067](#).

Environmental Commitments

In 2006, China elevated Energy Efficiency and Pollution Abatement as a national policy, positioning it on par with other key pillars of Chinese domestic policy. In 2012, soon after the Government of China last convened the NPC and CPPCC conferences, China released its National Clean Air FYP (2013 to 2018) to improve air quality. It proposed several measures including: (1) limiting or closing production at industrial facilities, (2) restricting personal vehicle traffic; and (3) replacing coal with clean energy.

In November 2015, China's State Council unveiled the 13th FYP for Economic and Social Development (2016-2020) focusing on: energy consumption reduction; environmental protection; and renewable and biomass energy use. The State Council also released "The Energy Development Strategy Action Plan (2016-2020)" which aims to cap annual energy use, and sets a goal of reaching 15 percent of non-fossil fuel-based energy usage in the country's primary energy mix by 2020. Biofuels are considered a critical component of this plan. In the end, through draconian measures, Beijing achieved its goal with an average annual PM 2.5 concentration of 58 micrograms per cubic meter for 2017.

To achieve 2013 FYP targets, Beijing authorities were ordered to achieve an average annual PM 2.5 concentration of less than 60 micrograms per cubic meter in 2017. Starting in October 2017, local officials in Beijing and 27 surrounding cities resorted to extreme measures, including ordering thousands of "super emitting" industrial facilities to pay "pollution fees;" to halve or to cease production; or to relocate. The measures slowed permitting of new construction, as well as operating throughput at existing ethanol plants further delaying progress towards China's E10 blending target.

Renewable Energy and Greenhouse Gas (GHG) Emissions

China's 13th Five-Year Plan for Greenhouse Gas (GHG) Control and Power Sector Development (2016-2020) was released on November 7, 2016. The FYP for GHG Control aims to reduce China's carbon intensity by 60 to 65 percent by 2020 compared to 2005 levels; to reduce overall energy intensity per unit of GDP by 15 percent; and to raise the share of non-fossil energy use from 12 percent of total energy use in 2015 to 15 percent by 2020. To meet this goal, China launched seven different pilot carbon emissions trading systems (ETS) in 2011. The national ETS will consolidate nine pilot regional carbon trading markets established since 2013 in Beijing, Tianjin, Shanghai, Guangdong, Shenzhen, Hubei and Chongqing, Sichuan and Fujian and only cover power generation. In December 2017, NDRC pushed back the launch of the national ETS to 2020, citing the need to collect further data on the power generation industry before trading can begin.

Paris Agreement Commitments

In 2016, China ratified the United Nations Paris Agreement on Climate Change (COP 21) to peak its carbon emissions around 2030. China also committed to reduce carbon intensity per unit of GDP by 60 to 65 percent, in comparison to emissions benchmarks established in 2005.

In March 2018, Xie Zhenhua, China's special representative on climate change, reported that China's carbon intensity per unit of GDP fell 46 percent between 2005 and 2017, fulfilling China's 2020 carbon intensity goal three years ahead of schedule. Some of China's cities are leaders in emissions reduction and have committed to peak carbon emissions before the national government's 2030 deadline. In May 2018, China reported that it will meet its commitments to reduce total carbon use ahead of schedule.

Blue Sky Protection Plan 2018

On July 3, 2018, China's State Council released a three-year "Blue Sky Protection Plan (2018-2020)" to reduce emissions for sulfur dioxide and nitrogen oxides by at least 15 percent from 2015 levels, and an 18-percent reduction in the density of particulate matter by 2020. The announcement proposes new restrictions on sales of fuel blending components such as methyl tert-butyl ether (MTBE), and the blending of chemical feedstocks in refined oil products. This is the first time that petrochemical feedstock blend use has been restricted in refined oil products, and the move will further boost demand for fuel ethanol as a transportation fuel additive in China.

National Ethanol Production and Blending Targets

At this time, Chinese law restricts fuel ethanol processing to licensed facilities that produce and supply fuel ethanol to national refiners and fuel marketing companies. Provincial Development and Reform Commissions (DRCs) are responsible for the distribution of franchise licenses for fuel production, refining, and marketing. See Section III. Ethanol, Production.

In anticipation of government policies to begin approvals and certification of new ethanol processors, independent, non-licensed producers have invested in expanded capacity to preemptively capture market share. See Section II. Gasoline and Diesel Pools.

Production Capacity of China's Fuel Ethanol Licensed Producers (2018 Estimates)

	Producers	Million Liters	Tons	Notes
1	Jinlin Fuel Alcohol	887	700,000	
2	Henan Tianguan	887	700,000	Production reportedly suspended in 2018
3	COFCO Biochemical (Anhui)	798	630,000	
4	COFCO Bioenergy (Zhaodong)	507	400,000	
5	SDIC (Zhanjiang)	190	150,000	
6	Shandong Longlive	63	50,000	Production reportedly suspended in 2018
7	COFCO Bioenergy (Guangxi)	253	200,000	
8	ZTE Zenergy (Inner Mongolia)	38	30,000	Production reportedly suspended in 2018
9	SDIC (Tieling)	380	300,000	Production on line in September 2018
10	Liaoyuan Jufeng Biochemical	380	300,000	
11	Jilin Boda Biochemistry	507	400,000	
12	Jiangsu Lianhai Biotechnology	152	120,000	
	TOTAL	5,042	3,980,000	

Source: Industry Sources

Premier Li Keqiang's Remarks on Ethanol

On August 22, 2018, Chinese Premier Li Keqiang addressed China's State Council, and reiterated the Central Government's commitment to expand ethanol use nationwide, and lower government inventories of grain, in an orderly manner. Although disputed by industry sources, state media reported that Premier Li announced a commitment to limit annual national biofuels consumption to 12,670 million liters (10 million tons).

He reiterated previous announcements and conventional wisdom among industry analysts. For example, China will continue to administer a licensing program restricting the number of fuel ethanol production facilities. China's industrial alcohol producers are encouraged to convert existing capacity to produce fuel ethanol in an "appropriate manner" to meet national demand. He called for further expansion of "alternative feedstock" research, development, and use, including cassava-based fuel ethanol facilities, as well as cellulosic ethanol and synthetic ethanol – pillars of China's ethanol policies. He hinted that China may promote "equal market access" for ethanol production, which either supports foreign direct investment for biofuels production, or indicates a willingness to support fair and balanced "national treatment" for both domestic and imported fuel ethanol.

Premier Li urged the Chinese biofuels industry to promote blends of fuel ethanol and gasoline in 15 additional provinces, including Beijing, Tianjin, and Hebei province by the end of 2018. The precise count of the number of provinces and cities impacted by this announcement is unclear. Some of the pilot provinces currently implementing E10 policies, such as Hebei, have partially implemented E10 gasoline in specific regions. There is some overlap between existing E10 programs in pilot provinces, and additional provinces announced by Premier Li.

Incremental Expansion of Ethanol Blending Zones to Cities and Provinces

China's latest E10 target is planned to follow an incremental expansion by pilot provinces and cities until the program is implemented nationwide. As of 2017, 11 provinces and cities were selected as fuel ethanol pilot zones for mandatory E10 blending, including full implementation in Heilongjiang, Henan, Jilin, Liaoning, Anhui, and Guangxi provinces, and partial implementation in Hebei, Shandong, Jiangsu, Inner Mongolia and Hubei provinces. In September 2017, a joint ministerial announcement publicized a nationwide target for the adoption of E10 ethanol-gasoline blend use by 2020.

Industry sources expect that in the greater "Jing-Jin-Ji" region (Beijing, Tianjin and Hebei), local and provincial authorities will promote fuel ethanol use in 2018, and that they will achieve full implementation of E10 by the end of 2019. Industry sources expect that the next expansion of E10 pilot areas will include the Yangtze River Delta (Shanghai and neighboring Zhejiang and Jiangsu provinces). China's Pearl River Delta (South Coastal provinces) is currently, and is expected to remain, a grain deficit region that will depend on imports of fuel ethanol if E10 fuel use is adopted there.

Government Financial Support for Ethanol Production

The government continues to emphasize that demand for feedstocks directed towards fuel ethanol production should not compete with inventories for food stocks, and promotes ethanol production using cassava, sweet sorghum and other non-food grain feedstocks. (See GAIN report [CH9059](#)). Central government production subsidies for grain-based ethanol were eliminated in 2016.

Meanwhile, from October 2016 to June 2017, several provincial governments in North East China offered subsidies to state-owned ethanol processors who purchased and processed old-crop corn inventories from the State Grain Administration to produce corn starch, amino acids, industrial alcohol, and fuel ethanol. (See GAIN report [CH16058](#).)

The advanced cellulosic ethanol production subsidy is \$0.07 per liter (600 RMB per ton). In 2018, there have been no additional announcements, or updates to the original subsidy program.

Import Tariffs

On December 19, 2016, the State Council Tariff Committee (SCTC) released the 2017 Tariff Adjustment Plan which lists changes in tariff rates for calendar year 2017. On January 1, 2017, the tentative tariff rate for denatured ethanol (HS 22072000) rose from 5 percent to the World Trade Organization (WTO) Most-Favored Nation (MFN) bound rate of 30 percent.

On April 2, 2018, SCTC, MOF, and the Ministry of Commerce (MOFCOM) released separate public announcements effective immediately, China would levy an additional 15-percent tariff on U.S. ethanol in response to the U.S. 232 Investigation, raising the effective tariff from 30 percent to 45 percent.

On July 6, China imposed an additional 25-percent tariff on imports of U.S. ethanol in response to the U.S. 301 Investigation, raising the effective tariff to 70 percent. (See GAIN reports [CH18017](#) and [CH18018](#)).

On August 3, 2018, the Ministry of Commerce (MOFCOM) issued a notice announcing tariff hikes on \$60 billion worth of U.S. imports in response to the U.S. 301 Investigation announcement on August 1. The MOFCOM announcement includes additional tariffs on U.S.-origin undenatured ethanol, raising the tariff from 5 percent to 45 percent. (See GAIN report CH 18047). The additional tariffs undercut the competitiveness of U.S. exports to China.

On August 23, China imposed an additional 25-percent tariff on U.S.-origin petroleum oils containing 1 to 30 percent biodiesel (HS code 27102000, Petroleum oils containing up to 30 percent biodiesel by volume), which effectively raised the tariff on this product from 6 percent to 31 percent (See GAIN report [CH 18034](#)).

Additional Tariffs Applied to U.S.-origin Biofuels Products						
HS Code	Product Name	MFN Rate	Additional 232 Rate	Additional 301 Rate	New Applied Rate	New Applied Rate
Entered Force on:		Jan 1	Apr 2	Jul 6	Jul 6	August 23
22071000	Undenatured Ethyl Alcohol, Of Alcohol V _≥ 80%	40	na	25	65	na
22072000	Ethyl Alcohol & Other Spirits, Denatured Of Any Strength	30	15	25	70	na
27102000	Petroleum oils containing 1-30% biodiesel (B1-B30) by volume	6	na	na	na	31

Tax Benefits

In 2017, China's General Department of Taxation lowered the effective VAT applied to exported ethanol products from 13 percent to 11 percent. (See GAIN report [CH 18022](#)). Biodiesel exports made from used animal and vegetable oils also enjoy a 70-percent VAT rebate. Qualified producers also benefit from a 90-percent discount on taxable income from relevant products. To support biodiesel development, tax authorities have issued policies to waive consumption taxes on B100 biodiesel produced using UCO.

Other Tax Policy Changes

Industry sources report that China's Ministry of Finance announced that effective March 1, 2018 independent crude oil refiners, also known as "teapot" refiners, are required to pay consumption taxes of \$38 per barrel of gasoline and \$29 of diesel produced. Higher taxes will lower production margins, and spur refiners to seek lower-cost substitutes, like ethanol and biodiesel.

II. Gasoline and Diesel Pools

China recognizes the strategic value of energy independence. Biofuels offer a means to stretch the value and efficiency of imported fossil fuel supplies, and a domestic product substitute for imported fuel supplies in the national fuel pool. China's ballooning crude oil imports and a domestic appeal to improve air quality are driving the adoption of expanded fuel ethanol consumption, and demand for alternative transportation options like NEVs.

In 2009, China's gross crude oil imports were only half of the current volume, or 4 million barrels per day. Today, China is the world's top destination for crude oil. In 2017, China's gross crude oil imports surpassed those of the United States for the first time rising to 419.5 million tons, up 10.1 percent from 2016. According to the General Administration of Customs of China, during the first ten months of 2018, China imported 2,764.6 million barrels (377.2 million tons) of crude oil, up 25 percent year-on-year.

China's gasoline market is now the second largest in the world, exceeding demand in the European Union a few years ago, and is only exceeded by the United States. But unlike the U.S. market, which has slowing gasoline consumption, China's gasoline market continues to expand rapidly with year-to-year growth surpassing all other markets. Although China's transport diesel market is the third largest in the world, China's annual diesel use is growing at a rate comparable to the United States and the European Union, two much larger markets. In the medium- to long-term, energy analysts forecast that China's rapid expansion of gasoline and diesel demand will slow due to flatter economic growth, and saturated automotive markets in major cities.

According to NDRC, over the first ten months of 2018, China's national crude oil consumption rose to 2,869 million barrels (391.4 million tons), up 9.6 percent compared with the same period in 2017. The Fuel Use Table below covers the entire fuel pools of refined fossil fuels and additives in finished fuel products.

With significant overcapacity, China is among the largest exporters of refined oil products. However, China's global rank as an importer of refined oil products is unclear. In the first ten months of 2018, China imported 27.1 million tons of refined oil, up 30.9 percent year-on-year.

Fuel Pool Use History (Million Liters)										
Calendar Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018f
Gasoline Total	86,112	96,913	105,738	113,592	130,015	135,660	157,237	167,460	172,896	178,999
Diesel Total	154,269	185,952	181,470	182,769	183,544	180,958	184,453	174,991	177,090	179,563
On-road	99,668	108,350	115,204	124,989	126,493	126,474	127,378	121,702	125,020	126,138
Agriculture	11,688	12,750	13,813	13,813	14,875	15,938	15,938	17,000	18,063	18,063
Construction & Mining	4,250	5,313	5,313	5,313	6,375	6,375	6,375	6,375	6,375	6,375
Shipping & Rail	na	na	na	450	346	246	237	227	215	215
Industry	21,250	22,313	19,125	18,063	18,063	17,000	15,938	15,938	14,875	14,875
Heating	32	43	26	26	28	50	66	64	74	74
Jet Fuel Total	na	na	na	na	na	na	na	na	na	na
Total Fuel Markets	238,558	282,657	278,593	287,782	307,025	314,318	342,248	341,326	346,737	351,675

Source: 2009-2017 Gasoline and Diesel Total estimates are based on OECD/IEA data in million liters. All other estimates are Post calculations based on the NBS series. Note: These data cover the entire fuel pools of refined fossil fuels and additives in finished fuel products. The “gasoline” pool includes methanol, MTBE, and ethanol, while the “diesel” pool includes very small biodiesel volumes. The average conversion rate for gasoline is 1,388 liters per metric ton, as used by China’s Customs and Taxation Bureau; the average conversion rate for diesel ranges from 930 to 1,195 liters per ton.

Retail gasoline prices have steadily risen over the past three months. Since 2013, NDRC has adjusted retail prices based on prevailing benchmark crude prices within a defined price band. Under the current pricing mechanism, if a moving average of benchmark crude prices varies by more than 50 RMB per ton (\$7.30) over the course of 10 working days, then prices of refined oil products such as gasoline and diesel are adjusted. When prices dip below \$40 per barrel, the price band mechanism is not in effect.

NDRC Retail Gasoline Price Changes since August 2018		
Date of Price Increase	\$ per ton change	RMB per ton change
August 7	10.00	70
September 4	2.60	18
September 17	25.00	170
September 30	35.00	240
October 20	24.00	165
November 2	23.00	150
November 16	73.00	-510

Source: Chinese media

World’s Largest and Fastest Growing Light-duty Vehicle Fleet

China surpassed the United States as the world’s largest light-vehicle (passenger) market, and leads the world in total new passenger vehicle sales. According to the Ministry of Public Security (MPS), China’s national passenger vehicle fleet grew rapidly in 2017 and 2018. On October 17, 2018, China’s national fleet reached 322 million vehicles, up 8 percent from 2017.

However, China’s automotive market faces headwinds in the long-term to continue its dramatic rise as the world’s largest passenger vehicle market. Automakers face several challenges including slowing economic growth, strict environmental controls, and market saturation in

major cities. In October 2018, the China Association of Automobile Manufacturers (CAAM) reported that September automotive sales fell by 11.6 percent year-on-year, the largest single month decline in seven years. Some analysts project that annual sales growth in 2018 will contract for the first time since the early 1990s.

Total Units	2014	2015	2016	2017
Local Production of Completed Cars	23,491,900	24,597,600	28,028,000	29,015,000
New Energy Vehicle Production	74,763	340,471	517,000	794,000
Exports of completed cars	950,000	755,500	708,000	1,063,800
Imports of completed cars	1,430,000	1,101,900	1,041,000	1,246,800
Market Size	22,833,590	24,944,000	28,361,000	29,198,000

* Year-to-date as of September 2018; (Total market size = (total local production + imports) – exports)
Sources: Global Trade Atlas, Ministry of Industry and Information Technology, China Association of Automobile Manufacturers

Shift from New Energy Vehicle (NEV) Buyer Subsidies to Production Quotas and Public Investment

China defines new energy vehicles (NEVs) as plug-in electric and gasoline/diesel-electric hybrid vehicles. Currently, NEVs make up less than 1 percent of China’s passenger vehicle market. Although the rate of NEV growth is impressive, the actual market impact on ethanol demand will remain very small for many years to come.

In October 2018, MPS reported that China’s national “New Energy Vehicle” (NEV) fleet reached 2.2 million vehicles in 2018, or less than 0.1 percent of total vehicles. Industry sources report that at the consumer-level China’s NEV demand is almost entirely supported by government subsidies and preferential benefits for NEVs such as road access and parking.

China’s regulatory requirements for powertrains in passenger vehicles will promote emissions reductions. In 2010, Chinese ministries offered generous buyer subsidies to promote NEV purchases. In December 2016, a number of Chinese ministries jointly issued a policy to lower the value of NEV buyer subsidies by 2017 and eventually phase out all subsidies by 2020.

“Made in China 2025” is a Chinese initiative to upgrade its national industrial base from a low-cost, mass production manufacturer to higher value-added, advanced production manufacturer. The plan prioritizes 10 sectors, including the automotive and NEV sectors.

The initiative’s objectives are both supply and demand based. On the supply-side, China has established a production quota for manufacturers to produce 1 million units of pure electric and plug-in hybrid cars in China by 2020, and raise the market share of domestically produced NEVs to at least 70 percent of national demand. On the demand-side, China’s Ministry of Industry and Information Technology (MIIT) targets national vehicle sales at 35 million vehicles by 2025, of which 20 percent will be NEVs. In September 2018, the China Association for Science and Technology projected that electric vehicle sales would account for 30 percent of China’s total vehicle sales by 2030.

In April 2017 China released its “Automobile Mid- and Long-Term Development Plan” which aims to make China a “strong” automobile manufacturing and marketing center within ten years and pre-emptively capture the NEV and intelligent vehicle market. Starting in April 2018, domestic automakers, including joint ventures, were required to fulfill an electric vehicle quota of at least 10 percent of total production by 2019, and 12 percent by 2020. Electric vehicle production quotas for 2021 and beyond are not yet available. Automakers that fall short of their quota are required to purchase credits from automakers that exceed their quota.

III. Ethanol

Overview

China is the world’s fourth largest fuel ethanol producer and consumer after the United States, Brazil, and the European Union. Until recently, China’s fuel ethanol market has remained insular. Imports were banned until as recently as 2015, and China rarely produced surplus volumes to export. As additional duties were implemented earlier this year, China’s fuel ethanol market retreated further from the global market.

China produces a broad variety of ethanol products at a commercial-scale, including potable alcohol, industrial chemicals, as well as fuel ethanol. Unlike other major ethanol producing countries, China’s major end use market is for other industrial chemicals and not fuel ethanol. Historically, China’s ethanol output has followed national policy priorities. Since 2016, China’s corn processors, including fuel ethanol and industrial chemical producers, have enjoyed the benefit of corn processing subsidies based on throughput volumes. Additionally, China is expected to expand gasoline-ethanol blending on a nationwide basis, expanding national demand, as well as investment to expand production capacity.

Despite strong Central Government support through policies and financial-backing, China’s ethanol sector faces structural challenges to produce sufficient fuel ethanol supplies to meet ambitious E10 goals, including a rapid shift in national consumption from the current 3.5 billion liters (2.8 million tons) to 18.6 billion liters (14.7 million tons) in 2020 to meet a national E10 target. Most experts consider China’s E10 consumption target to be nearly unattainable at the current pace of market development.

The majority of China’s existing fuel ethanol production capacity was established during the last push for expanded ethanol production in the late 2000s (See Annex 1). In the interim period, new investments to upgrade existing ethanol facilities have been delayed due to narrow producer margins and strict environmental regulations.

Ethanol Used as Fuel (Million Liters)										
Calendar Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018f
Beginning Stocks	0	0	0	0	0	0	0	186	172	56
Fuel Begin Stocks	0	0	0	0	0	0	0	186	172	56
Production (Million Liters)	3,718	4,135	4,619	5,286	5,795	6,921	7,868	8,071	9,211	9,770
Fuel Production	2,466	2,479	2,566	2,858	2,934	2,951	2,914	2,534	3,041	2,914
>of which is cellulosic	0	0	0	0	25	25	38	40	30	20
Imports	0	4	5	15	0	27	687	890	24	700
Fuel Imports	0	3	5	3	0	26	477	871	8	700
Exports	108	156	43	45	40	33	25	34	135	35
Fuel Exports	16	12	8	7	2	2	0	1	3	0
Consumption	3,610	3,983	4,581	5,256	5,755	6,915	8,344	8,941	9,216	8,168
Fuel Consumption	2,450	2,470	2,563	2,854	2,932	2,975	3,391	3,590	3,218	3,670
Ending Stocks	0	0	0	0	0	0	186	172	56	0
Fuel Ending Stocks	0	0	0	0	0	0	0	0	0	0
Total BalanceCheck	0	0	0	0	0	0	0	0	0	0
Fuel BalanceCheck	0	0	0	0	0	0	0	0	0	0
Production Capacity (Million Liters)										
Number of Refineries	5	5	5	6	6	7	7	10	11	12
Nameplate Capacity	2,500	2,500	2,600	3,000	3,000	3,200	3,200	3,600	4,200	5,000
Capacity Use (%)	99%	99%	99%	95%	98%	92%	91%	70%	72%	58%
Market Penetration (Million Liters)										
Fuel Ethanol	2,450	2,470	2,563	2,854	2,932	2,975	3,391	3,590	3,218	3,670
Gasoline	86,112	96,913	105,738	113,592	130,015	135,660	157,237	167,460	172,896	178,999
Blend Rate (%)	2.8%	2.5%	2.4%	2.5%	2.3%	2.2%	2.2%	2.1%	1.9%	2.1%

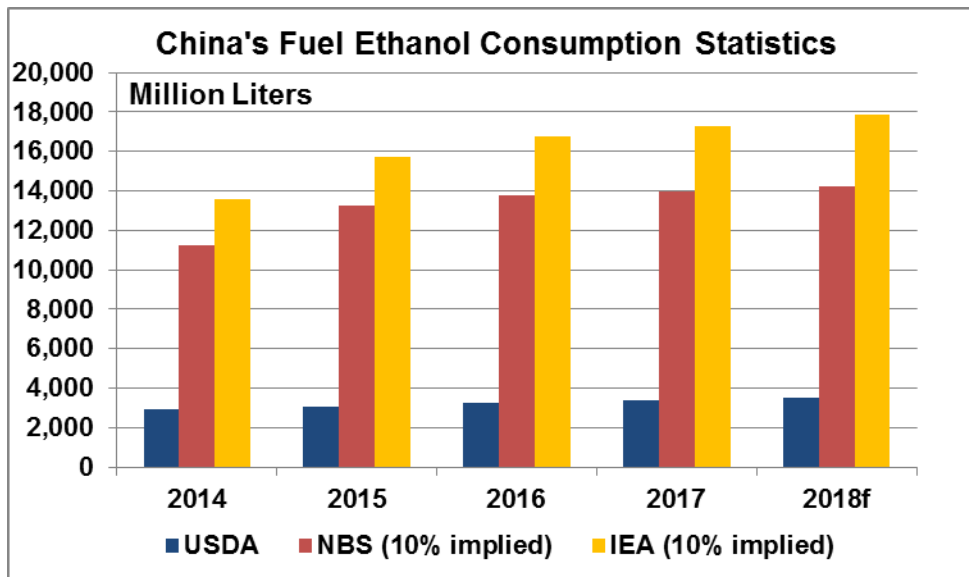
Source: Post estimates. Post has omitted fuel ethanol feedstock data. f = forecast

Consumption

Overall Chinese fuel ethanol demand is rising due to both policy and economic incentives. Rising crude oil prices; new tax requirements for independent refiners; production subsidies in selected provinces; more stringent environmental standards for airborne emissions; and expanded transportation fuel demand have incentivized fuel refiners to blend fuel ethanol into their finished fuel products to lower production costs and narrow margins. China's market potential for ethanol use has global implications for benchmark prices for refined fossil fuel products, corn, fuel ethanol, , and industrial chemicals, including MTBE and other fuel additives.

2018 total fuel ethanol consumption is estimated at 3,670 million liters (2.9 million tons), up 452 million liters (357,000 tons) from 2017 due to new government directives to expand fuel ethanol blending into gasoline supplies.

Energy statistics in China vary widely. According to the China National Bureau of Statistics (NBS), gasoline consumption in 2017 totaled 139,748 million liters (122 million tons). According to the International Energy Agency (IEA), China’s gasoline consumption in 2017 totaled 172,896 million liters.



Source: USDA, NBS, and IEA

If China fully implements a national E10 fuel ethanol and gasoline blending program by 2020, then IEA’s projection implies that China will consume 18,700 million liters (14.8 million tons) of fuel ethanol in 2020, or five and a half times greater than 2017 consumption (3.4 million liters). To meet domestic demand with domestic production, China would need to expand fuel ethanol production to 63,350 million liters (10 to 15 million tons), up by about 12,670 million liters. Even if existing approved fuel ethanol capacity, of 1,657 million liters per year (2.1 million tons), is brought on line, the additional output will not meet expected demand.

In 2018, China’s major independent crude oil refiners are scrambling to expand ethanol-gasoline blending operations throughout Shandong province, where a majority of China’s independent “teapot refiners” are based. According to media reports, China's top independent refiner, Dongming Petrochemical Group, has completed permitting requirements, and is cleared to begin blending E10 into its gasoline products. Dongming Petrochemical announced that it will import ethanol supplies for its refineries for blending through its trading arm Pacific Commerce Pte.

Additionally, two other major refiners have applied for MOFCOM licenses to blend ethanol into their gasoline products. Shandong Wonfull Petrochemical Group, based in Shandong province, and Henan Fengli Petrochemical Co, a refiner based in Henan province are seeking to directly market their finished gasoline for retail distribution or trading with other blenders.

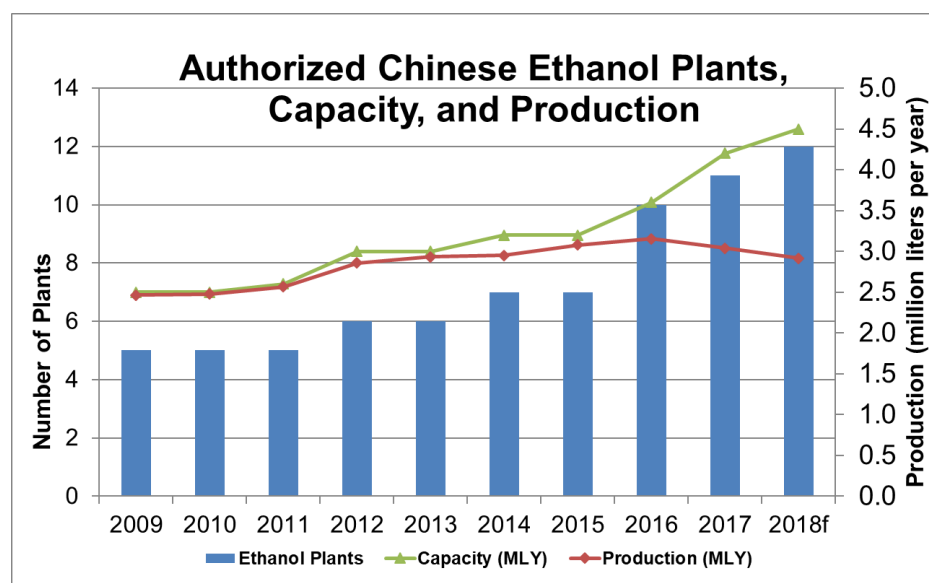
China’s 2018 ethanol-gasoline blend rate is projected at 2.1 percent, up from 2017 estimates. Rising petroleum prices and the depreciation of the Chinese Renminbi (RMB) relative to the U.S. dollar incentivize higher ethanol blend use in gasoline. However, absolute transportation fuel pool expansion outpaces the expansion of the ethanol-gasoline blend rate.

MTBE competes with ethanol as a gasoline oxygenate for improved engine performance in China. Recent regulations under the “Blue Sky Protection Plan (2018-2020)” restrict the use of MTBE, further supporting expanded ethanol demand. China does not produce ethanol-derived bio-ETBE (ethyl tert-butyl ether) in commercial volumes. Fuel blending formulations incorporating ETBE require additional processing, which have not been adopted in China.

Production

2018 total ethanol production (fuel and other industrial chemicals) is forecast at 9,770 million liters (7.7 million tons), up 559 million liters (441,000 tons) from 2017 on expanding industrial alcohol capacity. Additional industrial chemical production capacity for non-fuel ethanol is readily available to be converted and support future expansion of fuel ethanol production.

2018 fuel ethanol production is forecast lower at 2,914 million liters (2.3 million tons), down 127 million liters (100,000 tons), due to recent ethanol plant closures. Post forecasts 2018 operating capacity to remain far below name plate capacity, and a fuel ethanol supply gap below China’s E10 target of more than 15,786 million liters (12.5 million tons) in 2020.



Source: Post estimates. Note: million liters per year (MLY)

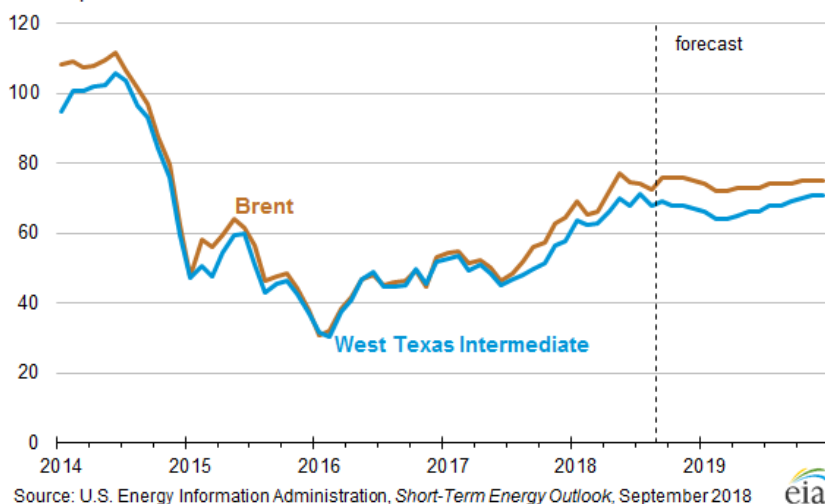
2017 fuel ethanol output is estimated at 3,041 million liters (2.4 million tons), up 509 million liters (40,000 tons) from 2016. Industry sources report that overall 2017 ethanol production, including fuel ethanol and industrial alcohol, was 11,403 million liters (9 million tons).

Existing ethanol production capacity in 2017 was estimated at 16,471 million liters (13 million tons), and actual operating rates were slightly higher than 50 percent. Industry sources report that the combined capacity of China’s twelve licensed fuel ethanol processors account for about 5,042 million liters (4 million tons). Fuel ethanol accounts for less than 3,168 million liters (2.5 million tons) of the total. An estimated 1,557 million liters (1.2 million tons) of production capacity were idle in 2017.

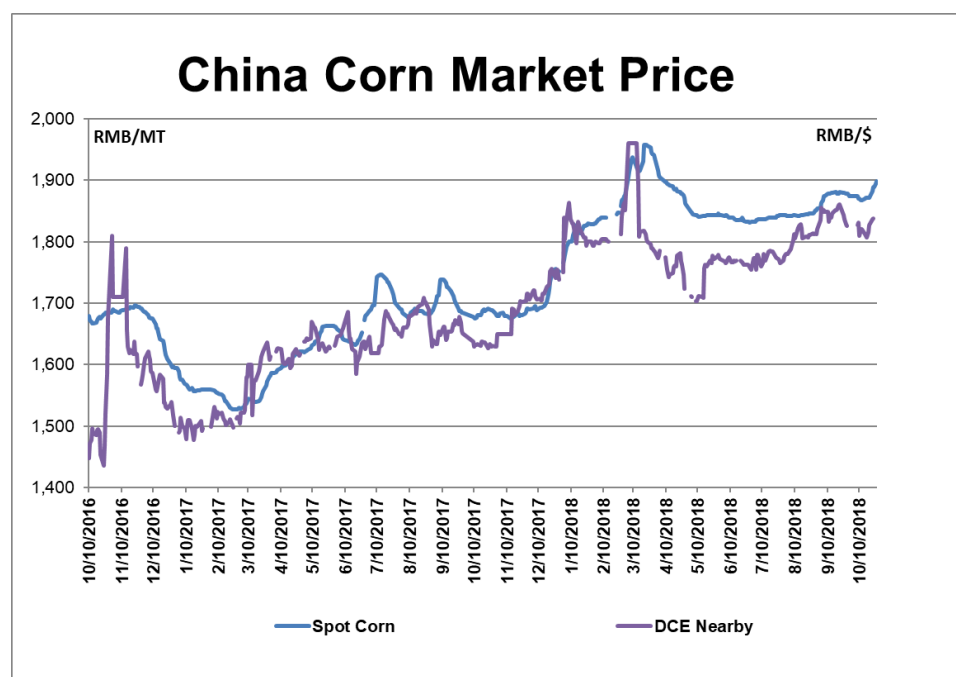
Wholesale Ethanol and Gasoline Price Spreads Are Widening

Figure 1. Monthly crude oil spot prices

dollars per barrel



Since 2016, crude oil prices have steadily climbed, also driving ethanol producer margins higher. According to China’s retail gasoline price band system, rising crude oil prices directly translate into retail gasoline price movements (See Section II. Gasoline and Diesel Pools). Furthermore, NDRC links fuel ethanol prices at 91.1 percent of the price of regular gasoline (#90 grade, petroleum). As a result, rising oil and gasoline prices over the past two years have corresponded with rising ethanol producer margins in China. As of September 30, wholesale quotes for fuel ethanol were hovering around \$1.10 per liter (7,776 RMB per ton), or up by more than \$0.40, or up by 36 percent, from mid-July 2018.



However, the costs of production for corn-based ethanol in China have not followed suit. The cost of corn, China's primary feedstock, has gradually risen, but not at the pace of change for crude oil and gasoline prices. Spot corn prices in China in October 2018 have gradually risen to about \$269 per ton (1,870 RMB). In 2018, the cost of feedstock ticked higher to about \$0.64 per liter (5,685 RMB per ton), or up by about 14 percent from July 2018. Today, the price spread between crude oil prices and ethanol producer costs continues to widen.

Higher ethanol producer margins in 2016 and 2017 spurred investment into expanded production capacity through the construction of new fuel ethanol plants rather than upgrading equipment, or expanding existing facilities. However, China's expanded production capacity is now underutilized, and is not expected to expand rapidly due to outdated equipment. Even if existing processing capacity is fully utilized, additional operation will raise national production by just 30 to 35 percent, well short of meeting China's E10 blend target.

After two years of delays, industry analysts forecast an additional 3,801 million liters (3 million tons) of additional fuel ethanol production capacity over the next three years. About 2,534 million liters (2 million tons) of additional fuel ethanol production capacity in North China is expected to be corn-based. Another 1,267 million liters (1 million tons) of new production capacity is expected to be cassava-based in South China.

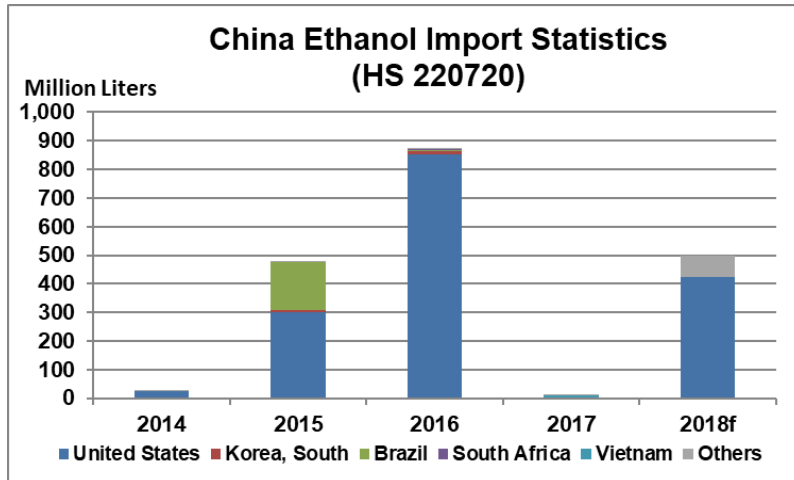
SDIC has four new ethanol production facilities planned, each with nameplate production capacities around 380 million liters (300,000 tons) for a combined total of 1,520 million liters of additional capacity in Northeast China. The project in Tieling, Liaoning province began operating in September 2018, and is the only facility to receive permitting approvals. In October 2018, SDIC reported progress towards development of its fuel ethanol projects in Hailun, Heilongjiang province; Bei'an, Heilongjiang province; and Fujin, Heilongjiang province. All three are expected to come on line in 2020. On April 18, Beidahuang Group announced the construction of a 443 million liter (350,000 tons) fuel ethanol project in Baotou, Inner Mongolia. Still other projects are being planned but remain in the early stages of development. Regionally, Northeast China is the most rapidly expanding location for investment into both new construction and upgrades to production capacity. As the location of China's Corn Belt and the Songliao Basin, a major oil and gas producing region, Northeast China is dotted with corn and oil fields, ethanol processors, and oil refiners.

China's industrial alcohol producers are expected to convert their idled production capacity and shift to supply a share of additional fuel ethanol production to fill China's shortfall in fuel ethanol production as it strives to reach the nationwide E10 goal. However, the precise details of timing and volume of production for the conversion of industrial chemical production to fuel ethanol production is unclear.

Trade

Imports

2018 fuel ethanol imports are forecast at 700 million liters (552,000 tons), up nearly 692 million liters (546,000 tons) from 2017 as higher tariffs offset additional demand due to E10 blending mandates entering into force by several provincial and local governments. Over the first ten months of 2018, trade data indicate that global exports to China reached 659 million liters (520,000 tons).



Source: Global Trade Atlas and GACC

China has historically banned ethanol imports. China opened its market to imports in 2015. Assuming current 2018 domestic fuel ethanol production, the pace of imports, and the Chinese Renminbi and U.S. dollar foreign exchange rates, Post projects that the bulk of 2018 imports of fuel ethanol to China in 2018 will be limited to deliveries during the first-half of 2018.

China raised the denatured ethanol tariff duty from 5 percent in 2016 to 30 percent starting from January 1, 2017, resulting in a 99 percent year-on-year drop of denatured ethanol imports in 2017. After the higher 30 percent duty entered into force, U.S. ethanol exports to China slowed at the beginning of 2017. Yet, U.S. ethanol prices continued to fall, eventually offsetting the higher duty by late 2017 and early 2018. Traders soon took advantage of the arbitrage opportunity and resumed importing U.S. ethanol.

On April 2, 2018, China levied an additional 15-percent tariff duty on U.S.-origin fuel ethanol, raising the tariff from 30 percent to 45 percent. Starting from July 6, 2018, China levied an additional 25-percent tariff, raising the effective tariff on U.S.-origin fuel ethanol to 70 percent.

Price Changes for U.S. Ethanol Exports to China						
	U.S. Gulf (\$ per L)	U.S. Gulf (RMB per ton)	RMB per USD	Applied Tariff	Landed Price (\$ per L)	Landed Price (RMB per ton)
May 2018	\$0.44	3,649 RMB	6.40	30%	\$0.67	5,489 RMB
June 2018	\$0.44	3,640 RMB	6.50	45%	\$0.74	6,122 RMB
July 2018	\$0.44	3,752 RMB	6.70	70%	\$0.89	7,300 RMB
Aug 2018	\$0.37	3,230 RMB	6.80	70%	No quotes	No quotes
Sept 2018	\$0.37	3,230 RMB	6.85	70%	No quotes	No quotes
Oct 2018	\$0.36	3,130 RMB	6.90	70%	No quotes	No quotes

Newly implemented import tariffs on U.S.-origin ethanol have ended an arbitrage opportunity for U.S. ethanol exports to China, and seemingly the largest cost competitive supplier to China.

However, according to S&P Platts, in October 2018, China imported about 60 million liters (50,000 tons) of industrial grade ethanol from Pakistan duty-free under the China-Pakistan Free Trade Agreement in August and September 2018. Additionally, China Customs data indicate that Indonesia exported 35.6 million liters (281,000 tons), and from July to September 2018 Malaysia exported 111 million liters (87,000 tons) to China. Malaysia is a negligible fuel ethanol producer. 2018 is the first year that Malaysia has exported ethanol to China in commercial volumes.

If China sharply lowers duties on U.S. ethanol, demand for imports will raise the prospects for expanded U.S. exports to China to as high as 1,300 million liters (1 million tons). At this time, the United States remains the world's lowest cost producer.

Exports

China has low exportable supplies of ethanol. 2018 fuel ethanol exports are forecast at less than 126.7 million liters (100,000 tons), down 2.5 million liters (197,316 tons) as policy-driven demand currently outstrips national supplies. China exports ethanol to South Korea and Thailand. 2017 fuel ethanol exports soared to 2.6 million liters (205,209 tons), up 77 percent from 2016, as ethanol processors benefited from the reinstatement of a VAT export rebate.

IV. Biodiesel

Overview

With the exception of minor tax incentives for the consumption tax and export rebates, biodiesel does not receive any subsidies nor mandate support that fuel ethanol enjoys, and must compete with other markets for used cooking oil feedstock. This being the case, the market for biodiesel remains very limited and the national average blend have never moved off of 0.2 to 0.3 percent. From 2013 to 2014, biodiesel demand expanded when benchmark crude oil prices hovered above \$100 per barrel. At the time, consumption reached a record 2.1 billion liters (1.8 million tons) evenly supplied by domestic production and imports. However, in 2015 crude oil prices collapsed, and margins inverted into negative territory. As China implements more stringent environmental measures, prospects for expanded biodiesel use are growing. Overall Chinese discretionary demand for diesel is similar to 2015.

Biodiesel (Million Liters)										
Calendar Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018f
Beginning Stocks	na	na	na	na	na	na	na	na	na	0
Production	591	568	738	927	1,079	1,133	787	909	1,043	1,140
Imports	0	0	0	31	446	1,000	33	8	18	340
Exports	0	0	0	0	0	32	23	76	194	350
Consumption	591	568	738	958	1,525	2,101	797	841	867	1,130
Ending Stocks	na	na	na	na	na	na	na	na	na	na
BalanceCheck	0	0	0	0	0	0	0	0	0	0
Production Capacity (Million Liters)										
Number of Biorefineries	62	45	49	52	53	53	53	48	46	44
Nameplate Capacity	2,670	2,556	3,400	3,600	4,000	4,000	4,000	2,680	2,680	2,680
Capacity Use (%)	22.1%	22.2%	21.7%	25.8%	27.0%	28.3%	19.7%	33.9%	38.9%	42.5%
Feedstock Use for Fuel (1,000 MT)										
Used Cooking Oil	578	556	722	907	1,055	1,108	771	891	1,022	1,117
Market Penetration (Million Liters)										
Biodiesel, on-road use	177	170	221	270	324	340	236	273	313	410
Diesel, on-road use	99,668	108,350	115,204	124,989	126,493	126,474	127,378	121,702	125,020	126,138
Blend Rate (%)	0.2%	0.2%	0.2%	0.2%	0.3%	0.3%	0.2%	0.2%	0.3%	0.3%
Diesel, total use	154,269	185,952	181,470	182,769	183,544	180,958	184,453	174,991	177,090	179,563

Source: Post estimates or industry sources

Notes: the average conversion rate for diesel varies from 930 to 1,195 liters per metric ton. Information on stocks is not available and are set at zero to balance the table. The feedstock:fuel conversion rate used is 1 metric ton of UCO yields 1,022 liters of biodiesel. U.S. and European industry conversion rates are closer to 1,043 liters.

Consumption

2018 biodiesel consumption is estimated at 1,130 million liters (1 million tons), up nearly 30 percent than the previous year, but well below record domestic use in 2014. When crude oil prices were elevated in 2014, biodiesel use rose to 2.1 billion liters, supplied by both domestic production and imports. In China, by way of contrast to other countries, biodiesel is used primarily to fuel electrical power generation, fishing vessels, and farm equipment. Industry sources report that on-road transport accounts for about one-third of total demand.

At this time, Shanghai is the only local authority implementing a biodiesel program. In October 2017, Sinopec Shanghai began offering B5 diesel at a \$0.05 per liter (0.3 yuan) discount to regular diesel as part of a pilot program. B5 consists of 5 percent biodiesel, and 95 percent diesel. With full market maturity, Shanghai will consume as much as 682 million liters (600,000 tons) of B5 (or 34 million liters of pure B100 biodiesel) each year. The Shanghai program aims to buck an historical precedent where previous efforts to adopt local and provincial biodiesel blending mandates have failed.

Production

2018 biodiesel production is forecast higher at 1,140 million liters, up 100 million liters (88,000 tons) from 2017, and similar to historical record production in 2013 and 2014. Higher crude oil prices, during part of 2018, and rising exports support China's expansion in biodiesel production.

China's biodiesel industry continues to wholly rely on used cooking oil (UCO) for feedstock. Some smaller food-grade oil brokers blend waste cooking oil, commonly known as "gutter oil," with food-grade oil to resell for restaurant use. From its inception, China's biodiesel production plan has aimed to divert UCO away from food use and allay concerns about food safety. In 2013, researchers at Tsinghua University estimated that China is the world's leading producer of waste oil and fats, producing 13.74 million tons in 2010.

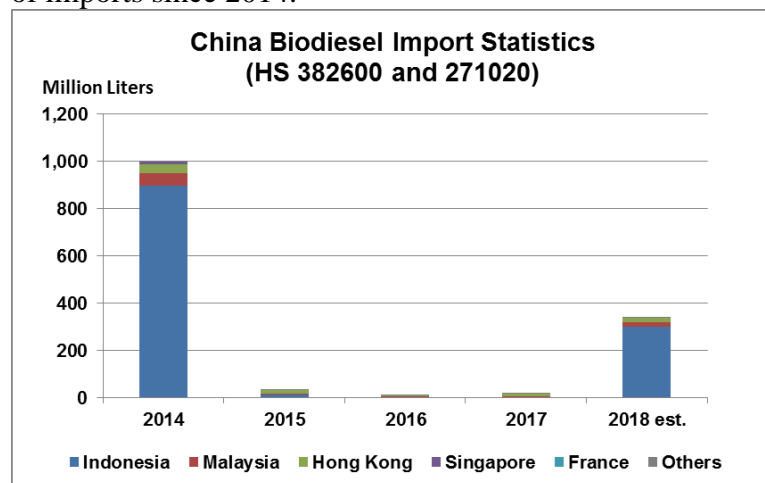
According to the Chinese Academy of Sciences (CAS), China's name plate biodiesel capacity in 2015 was between 3,420 to 3,990 million liters (3 to 3.5 million tons). However, industry sources report that many of China's largest biodiesel processors are idled and national production capacity is now near 1,140 to 1,710 million liters (1.0 to 1.5 million tons). Post estimates current capacity near 2,700 million liters with a capacity utilization rate near 40 percent.

With the exception of a few tax breaks, and no other financial support and no prospects for provincial or a nationwide blending mandate, China's biodiesel market will remain extremely limited and subject to competition from typically lower priced fossil-based diesel. Implementation of China's ETS program for biodiesel users or expanded adoption of fuel ethanol and gasoline blending programs at the provincial or Central Government level would promote demand. Alternatively, China could implement policy measures such as subsidies or greater tax incentives to narrow the gap between biodiesel and fossil diesel prices at the pump.

Trade

Imports

2018 biodiesel imports are forecast to rise to 340 million liters (300,000 tons), the highest level of imports since 2014.



Source: Global Trade Atlas and GACC

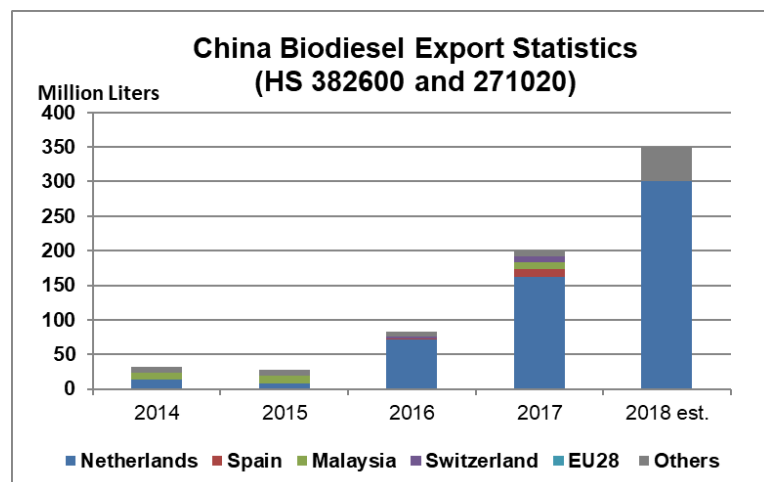
Note: All product trade under HS 3826.00 is assumed to be pure B100 biodiesel; All product trade under HS 271020 as petroleum oil, containing biodiesel up to 30 percent, is assumed to contain on average 10 percent biodiesel by volume, converted and reported as B100 equivalent.

Indonesia and Malaysia export price competitive biodiesel using palm oil as feedstock, also known as palm methyl ester (PME). Major suppliers of non-palm oil biodiesel (the United States, Argentina, and Europe) cannot compete with PME on price alone. In addition to price, alternative biodiesel feedstocks to palm oil can be more competitive when GHG emissions or other environmental sustainability criteria are considered. China does not apply environmental criteria to imports or domestic use of biofuels. Additionally, because China has no policy mandate, economic incentives are the primary market driver. China imports biodiesel when discretionary blend use emerges during periods of higher oil prices.

In May 2018, Chinese buyers booked 340 million liters (300,000 tons) of PME. The Palm Oil-Gasoil (POGO) spread, the gap between rising crude oil prices and falling palm oil prices, widened to create an arbitrage window for fuel traders. Despite favorable prices for PME, Chinese refiners undermined consumer confidence in their finished product by blending cheaper-PME at percentages ranging between 10 and 30 percent creating off specification finished diesel products. This resulted in performance issues for the marine and trucking industries. As a result, during the second half of 2018, domestic users stopped buying biodiesel from importers.

Exports

2018 biodiesel exports are estimated at a record 350 million liters (308,100 tons), up 156 million liters (137,300 tons) from record 2017 sales. EU biofuels policies incentivize demand for waste-stream biofuels including UCO-based biodiesel. As a result, Chinese exports of biodiesel to the EU have grown in recent years.



Source: Global Trade Atlas and GACC

Note: All product trade under 3826.00 is assumed to be pure B100 biodiesel; all product trade under HS 271020 as petroleum oil, containing biodiesel up to 30%, is assumed to contain on average 10% biodiesel by volume, converted and reported as B100 equivalent.

V. Advanced Biofuels

In China, fuel ethanol is mainly produced from corn. However, the industry is investing significant resources to transition feed stock use from corn and cassava feedstock to bio-based cellulosic feedstock, as well as coal- and industrial flue gas-based methanol feedstocks for synthetic ethanol production.

Bio-Based Fuel Innovation

The government actively promotes demonstration and pilot projects. On May 10, 2017, China's Central Government announced its 13th FYP for Biological Innovation. The plan focuses on promoting innovation in biological-based technologies, including new energy sources using bio-based feedstocks like cellulosic ethanol.

Generation 1.5 Biofuels - Defined as Non-food Grain, Non-Cellulosic Biofuels

Ethanol from non-food grain feedstocks is considered an advanced biofuel in China. After 2010, and until just recently, China limited the growth of corn use as a feedstock for fuel ethanol production through restrictions throughout the value chain, and phasing-out national production supports. In 2013 and 2014, when rising domestic grain prices triggered food inflation concerns, China became a net corn importer.

Cassava- and sweet sorghum-based ethanol production remain in research and exploratory phases of commercialization. High operating costs have limited expansion of production capacity using these feedstocks. China depends on imported cassava for most of its non-food grain ethanol production. High-costs and logistics hampered full-scale operations, which ultimately led to the closure of the project. Lastly, ethanol production subsidies for non-food grain, non-cellulosic feedstock use were discontinued after 2017.

In 2008, COFCO established its first cassava-based 200,000 ton (253 million liter) capacity fuel ethanol demonstration plant in Guangxi Province only to later shutter the plant when it faced soaring raw material costs and resistance from fuel retailers. Cassava-based ethanol producers relied on imports for 80 percent of their feedstocks. In 2016, Thailand restricted exports of cassava to China, resulting in the closure of several processors. As a result, future expansion plans for cassava-based plants in Zhejiang and Guangdong provinces never materialized.

The plan to use jatropha oil as a biodiesel feedstock never materialized. Trees covering hillsides in Southwest China were abandoned years ago because they failed to pollinate and lacked sufficient water.

Generation 2 Biofuels – Defined as Biofuels Made From Cellulosic Feedstocks

According to the 12th Five Year Plan (2011-2015) for strategic emerging industries, China aimed to develop biomass energy sources to develop Generation 2 biofuels including production of 5,068 million liters (4 million tons) of cellulosic fuel ethanol, and 1,136 million liters (1 million tons) of algae-based biodiesel.

Cellulosic ethanol is prominently featured in the joint announcement by China's NDRC and other ministries in the September 2017 "Implementation Plan for the Expansion of Ethanol Production and Promotion for Transportation Fuel."

The advanced cellulosic ethanol production subsidy is RMB 600 per ton (\$0.07 per liter). Prospects for 2018 remain uncertain as extensions or updates to the original subsidy program have yet to be announced at this time. Early cellulosic ethanol projects have failed to meet expectations. COFCO reports that the viability of cellulosic ethanol depends on crude oil prices, which must exceed \$100 per barrel. In late July 2018, benchmark crude oil prices hovered around \$70 per barrel.

In 2013, Shandong Longlive established a 63-million-liter (50,000 ton) per year capacity corn stover-based fuel ethanol production line, this facility recently ceased operations. In 2012, Henan Tianguan established a 12.7-million-liter (10,000 tons) capacity cellulosic ethanol pilot project, which also reportedly suspended production several years ago. Cellulosic projects in Shandong and Heilongjiang were on the cusp of commercial viability five years ago with high crude oil prices, but still remain in development phase, as demonstration projects, or have entirely ceased operations today.

COFCO pledged to build several 63-million-liter (50,000 ton) capacity cellulosic fuel ethanol plants in future. In March 2018, Songyuan Guanghe Energy in Jilin province proposed the construction of a 1.6-million-ton-throughput-capacity agricultural waste bio-refinery project that will have annual capacity to produce 253 million liters (200,000 tons) of cellulosic ethanol.

In March 2018, Jilin province solicited investment capital for the relaunch of a 126.7-million-liter-per-year (100,000 ton) cellulosic ethanol plant. The project was originally a joint venture between DuPont Pioneer and Jilin Province New Tianlong Industry in July 2015, using DuPont technology and enzymes in partnership with Jilin provincial land and capital. However, groundbreaking on the project stalled.

According to Asiachem's 2018 Fuel Ethanol Annual Report, China's cellulosic fuel ethanol production capacity, projects operating and under construction, is forecast to reach 3,928 million liter (3.1 million tons) in 2018.

Cellulosic ethanol faces logistics challenges to supply reliable volumes of feedstock at low cost, and the technology conversion to commercial scale faces significant hurdles. China's cellulosic ethanol industry, like those found elsewhere, face challenges including high levels of foreign matter in bales of stalks, straw, and stover and optimizing the use of enzymes to convert cellulosic material to energy. As elsewhere, processors struggle to comply with local regulations for air and water waste management.

Bio-energy is commonly cited as a preferred option for the disposal of large volumes of crop residues in China. China's estimated national crop straw and stalks resources are between 800 million tons and 1.1 billion tons. In 2015, corn stover was estimated to account for 225 million

tons of China's annual production of crop residues. Jilin province reportedly produces 23 million tons alone. Each ton of corn as grain yields about 1.1 tons of corn straw residues.

In China, growers customarily either burn crop residues in the fields, or gather and bundle these residues to use as heating fuel for the winter. Since 1999, local authorities have announced strong enforcement measures to lower particulate matter emissions and air pollution and curb the practice. In 2017, MOF offered subsidies as high as \$1.5 million to \$3.0 million (10 to 20 million RMB) for each city and county pilot project to utilize straw as an energy feedstock. Qualified projects include procurement of stalk processing equipment, such as baling machines, straw and stalk-based bioenergy electrical power generation, and construction of straw and stalk buying points (receiving, grading, storage, and marketing). Farmers face cash penalties and detention if they fail to comply with burning rules.

However, the economic cost of gathering and transporting crop residues exceeds the subsidy value offered by local authorities. A recent economic study reports that straw collection is limited by low economies of scale, lack of public awareness, and limited access to equipment.

Aviation Biofuel

In September 2012, Sinopec partnered with Airbus to develop a Chinese national standard “#1 bio-jet fuel,” based on proprietary processing technology at its Hangzhou refinery. In November 2017, Boeing and Sinopec partnered with China's Hainan Airlines to power an 11,000 kilometer Boeing 787 Dreamliner flight using UCO-derived jet fuel. Hainan Airlines previously conducted a biofuels-based flight in 2015. Currently, there are no “off-take” agreements to supply commercial flights on a regular ongoing basis.

Synthetic Fuel Ethanol

China's efforts to reduce air particulate matter include projects that convert waste gas from steel mills and industrial smelters and coal-based methanol into synthetic ethanol.

In January 2017, China launched the world's first coal-to-ethanol production facility in Shaanxi province. The Shaanxi Yanchang Petroleum facility has a single production line with about 126.8 million liters of annual production capacity. The facility uses technology developed by CAS and Dalian Institute of Chemical Physics in Liaoning province to produce 99.17 percent anhydrous ethanol, and is on track to expand annual production to 1,268 million liters by 2020.

Between 2014 and 2017, Celanese Industries operated an ethanol processing plant in Nanjing, Jiangsu province with an annual name plate capacity of 275,000 tons. The plant was shuttered in 2017. The company plans to reopen this facility in 2019.

In January 2018, Enerkem, a Canadian biofuels producer, and Sinobioway, a Chinese bioenergy firm, signed a \$100 million agreement of intent to jointly construct about 100 municipal solid waste-to-bioethanol plants by 2035.

Industry sources project that China's acetic acid and synthetic gas projects under construction (listed below), if successful could contribute an additional 3,294 million liters (2.6 million tons) of annual production capacity to national production in the next couple years. Despite the successful launch of synthetic ethanol technology, China is expected to impose more stringent environmental standards that may halt plans to move forward or constrain further expansion of existing processing facilities. Nevertheless, state-owned enterprises and private investors continue to show interest in expanding synthetic ethanol.

Annex I

China's Long March towards National Biofuel Market Development: Production/Consumption Targets and Feedstock Priorities.

10th FYP (2001-2005) – Corn Surplus Period

China implemented fuel ethanol programs starting in the early 2000's in response to abundant grain supplies. In MY1998/99, USDA ending stocks estimates reached record highs at 123.8 million tons. During this time, China's rapid growth in consumer demand outpaced productivity gains. Although, China adopted a long-standing ban on the use food-grains for fuel ethanol production, and the promotion of non-food feedstock (non-grains) for fuel ethanol, the vast majority of domestic ethanol production relied on existing corn supplies. Beginning 2005, the Government of China promoted the use of non-food fuel ethanol production as Generation 1.5 ethanol, as global grain prices soared.

11th FYP (2006-2010) – Corn Surplus Moderated

China's 11th Five-Year Plan (2006-2011) was the first targeting the production of biofuel from non-grain materials, including sweet sorghum, potatoes, and cassava for ethanol, and jatropha trees for biodiesel. (See Section VI, Advanced Biofuels).

Beginning in 2006, 11 provinces (Heilongjiang, Henan, Jilin, Liaoning, Anhui, Guangxi, Hebei, Shandong, Jiangsu, Inner Mongolia and Hubei) were selected as pilot zones for fuel ethanol production and mandatory E10 blend use. Many fuel retailers have argued in courts and protested against state-owned petroleum giants that China's implementation of biofuels blending targets restrict their ability to respond to market prices, undercutting their profitability and the long-term sustainability of their businesses. As a result of these concerns, some regions do not strictly enforce province-wide E10 blending requirements.

In August 2007, NDRC published a "Mid- to Long-term Renewable Energy Development Plan" that targets annual fuel ethanol use to exceed 12,670 million liters (10 million tons) by 2020, effectively expanding production by five-fold from 2017 to 2020.

During a period of high corn prices in 2008, China restricted construction of new ethanol facilities. Starting in 2010, Central Government subsidies for conventional ethanol plants began to be phased out, falling from RMB 2,000 per ton (\$318) in 2009 to zero in 2016. Ethanol production subsidies using non-food grain feedstocks were also phased out by 2018. Afterwards, China limited the growth of corn use for fuel ethanol when rising domestic grain prices triggered food price concerns. During this same period, China became a net corn importer.

12th FYP (2011-2016) – Corn Surplus Period

In 2010, the government set ambitious targets for ethanol and biodiesel in its 12th FYP, including a goal of producing 5,068 million liters (4.0 million tons) of fuel ethanol and 1,136 million liters (1.0 million tons) of biodiesel by 2015.

Despite significant investments in research and development, government efforts to expand production of non-grain conventional fuel ethanol never materialized into commercial-scale projects. (See Section VI, Advanced Biofuels).

The 12th FYP goal for biodiesel was met early in 2014. However, both biofuel production targets fell short in 2015. In 2015, ethanol production reached just 3,078 million liters (2.4 million tons), or less than two-thirds of the original 5,068 million liter (4.0 million ton) 12th FYP goal.

13th FYP (2016-2020) – Corn Stocks Drawdown

On October 24, 2016, China's State Council announced its 13th FYP goal to produce 5,068 million liters (4 million tons) of ethanol and 2,272 million liters (2.0 million tons) of biodiesel by 2020. While the goal projects ethanol production to rise four-fold from current levels, underlying economic fundamentals and the lack of national or provincial government support undermine large-scale efforts to expand production.

Government policies introduced in 2016 paved the way for a fuel ethanol industry revival through the elimination of the temporary reserve policy for corn; more stringent vehicle fuel efficiency and emissions standards; and the reinstatement of the VAT refund on ethanol products. Industry sources report that China's provincial corn processing subsidies and a nationwide blending policy are supporting margins for ethanol producers.

On September 13, 2017, NDRC, NEA, Ministry of Finance (MOF) and 12 other ministries jointly announced a plan to expand ethanol production and promotion for transportation fuel. This includes a nationwide target of implementing 10-percent ethanol blending into gasoline fuel by 2020, and a proposed shift to commercial-scale cellulosic ethanol by 2025. To date, the Government of China has not proposed a volumetric target for commercial-scale cellulosic ethanol production.

To date, pace of fuel ethanol production capacity expansion has accelerated, but currently faces a number of headwinds related to environmental regulations and technical limitations (See Section III, Ethanol and Section IV, Advanced Biofuels).