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Biofuels Issues and Trends

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Abbreviations

AFDC	Alternative Fuels Data Center
CARB	California Air Resources Board
DOE	U.S. Department of Energy
E10	A blend of 10 percent ethanol and 90 percent gasoline by volume
E15	A blend of 15 percent ethanol and 85 percent gasoline by volume
E85	A blend of 51 to 83 percent ethanol by volume and gasoline
EIA	U.S. Energy Information Administration
EISA	Energy Independence and Security Act of 2007
EPA	U.S. Environmental Protection Agency
LCFS	Low Carbon Fuel Standard
NA	Not Available
OPIS	Oil Price Information Service
RFS	Renewable Fuel Standard, Energy Policy Act of 2005
RFS2	Renewable Fuel Standard, Energy Independence and Security Act of 2007
RIN	Renewable Identification Number
RBOB	Reformulated blendstock for oxygenate blending
USDA	U.S. Department of Agriculture
VEETC	Volumetric Ethanol Excise Tax Credit
WASDE	World Agriculture Supply and Demand Estimates

Highlights

Biofuels is a collective term for liquid fuels derived from renewable sources, including ethanol, biodiesel, and other renewable liquid fuels. This report focuses on ethanol and biodiesel, the most widely available biofuels. From 2009 to the middle of 2012, the U.S. biofuels industry increased its output and prepared to meet an expanded Renewable Fuel Standard (RFS2),¹ which requires increasing volumes of biofuels use. In 2011, the biofuels industry transitioned away from tax incentives for non-cellulosic biofuels, which expired at the end of 2011. Annual ethanol and biodiesel consumption, production, imports, and exports during 2009-11 are summarized in Table 1.

Highlights from the report include:

- Ethanol grew from 8 percent of U.S. gasoline consumption by volume in 2009 to nearly 10 percent in 2011 and in the first eight months of 2012. With almost all gasoline in the United States already blended with 10 percent ethanol (E10), the maximum level approved for use in all cars and light trucks, significant increases in domestic consumption of ethanol face a *blend wall* unless higher percentage ethanol blends can achieve significant market penetration.
- While the U.S. Environmental Protection Agency (EPA) has approved use of a 15 percent ethanol blend (E15) for model year 2001 and newer cars and light trucks, concerns related to automobile warranties, potential liability for misfueling, and infrastructure costs are likely to limit E15 use to low volumes in the near term.
- Exports of ethanol increased substantially as producers looked abroad for new markets and Brazil experienced a poor sugar harvest during 2011-12.
- In the 2010/11 agricultural marketing year,² 40 percent of the corn crop and 14 percent of soybean oil production was used to produce biofuels and other products, including distillers grains for use as animal feed.³
- The federal excise tax credits for non-cellulosic ethanol and biodiesel and the ethanol import tariff expired at the end of 2011.
- A serious drought in the midwestern United States during summer 2012 lowered production estimates for corn and other crops, resulting in higher prices and a reduced forecast for biofuels production for the 2012/13 marketing year.
- Plans for a pipeline to deliver ethanol from the Midwest to the Northeast were withdrawn during 2011.
- Cellulosic biofuels production to date is far below the targets set by the Energy Independence and Security Act of 2007 (EISA 2007). EPA issued waivers that substantially reduced the cellulosic biofuels obligation under RFS2 for the 2010, 2011, and 2012 program years. Even that anticipated level of commercial production failed to materialize. There was no production of cellulosic biofuels or Renewable Identification Numbers (RINs) in 2010 or 2011. While a small

¹ See Appendix A.

² Marketing years span calendar years and are often written to include both calendar years. For example, 2010/11 refers to the marketing year beginning September 1, 2010 and ending August 31, 2011 for corn. Marketing years differ by commodity; the marketing year for soybeans and other oilseeds begins on October 1. <http://www.ers.usda.gov/data-products/feed-grains-database/documentation.aspx#myears>

³ U.S. Energy Information Administration (EIA) calculation. See Appendix C.

number of cellulosic RINs may be available to be applied towards the reduced RFS2 requirements for 2012 set under EPA's waiver,⁴ production of cellulosic biofuel RINs in 2012 is likely to be well short of the reduced 2012 requirement.

Table 1. Ethanol and biodiesel summary, 2009-11

(million gallons unless otherwise noted)

	2009	2010	2011
Ethanol			
Consumption	11,037	12,858	12,871
Consumption (Percentage of Gasoline by Volume)	8.0	9.3	9.6
Production	10,938	13,298	13,948
Gross Imports	198	16	172
Gross Exports	NA	399	1,195
Biodiesel			
Consumption	326	263	878
Consumption (Percentage of Distillate Fuel by Volume)	0.6	0.5	1.5
Production	516	343	967
Gross Imports	77	23	36
Gross Exports	266	105	73

Sources: EIA, *Monthly Energy Review*, August 2012. Ethanol Production and Consumption: Table 10.3. Biodiesel Production, Imports, Exports, and Consumption: Table 10.4. Motor Gasoline Supply and Distillate Fuel Supply: Table 3.5. EIA, *Petroleum Supply Annual*, Table 1. See Appendix C for descriptions of calculations of percentage of gasoline or distillate fuel by volume.

⁴ U.S. Environmental Protection Agency (EPA) Moderated Transaction System, <http://www.epa.gov/otaq/fuels/rfsdata/2012emts.htm>.

Introduction

This *Biofuels Issues and Trends* report presents data on biofuels consumption, production, imports and exports, including data collected by others than the U.S. Energy Information Administration (EIA). It also discusses important developments in biofuels markets.

Legislation and regulations are important factors in the production and consumption of ethanol and biodiesel. Processing plants are being built to produce the required annual volumes and market participants are sensitive to legislative and regulatory developments. Key legislation and regulations issued since 2009 are identified below. Appendix A provides more details.

- EPA issues new rules for biofuels use each year establishing the Renewable Fuel Standard (RFS2)⁵ volume requirements and associated percentage standards that will apply in the following calendar year for cellulosic biofuels, biomass-based diesel, advanced biofuels, and total renewable fuel.
- EPA granted approval in January 2011 for the use of gasoline blended with 15 percent ethanol (E15) in model year 2001 and newer vehicles.⁶
 - Numerous ethanol producers received approval to sell their products for blending into E15.⁷
 - The first gallons of E15 were sold in July 2012 in Lawrence, Kansas.
- California continued work on the Low Carbon Fuel Standard (LCFS), a state-enacted policy to reduce greenhouse gas emissions from motor vehicles.
 - Implementation began in January 2011 but was halted by an injunction in December 2011 as two separate lawsuits worked their way through the state and federal courts.
 - The injunction was lifted in April 2012 but litigation continues.
- The Volumetric Ethanol Excise Tax Credit (VEETC) of \$0.45 per gallon of ethanol blended with gasoline expired on December 31, 2011.
- The \$0.54-per-gallon tariff imposed on imported fuel ethanol expired on December 31, 2011.
- The retroactive reinstatement of the \$1.00-per-gallon biodiesel tax credit that occurred in late 2010 was effective for biodiesel produced in 2010 through its expiration at the end of 2011.

This report addresses the ethanol and biodiesel markets separately, reviewing recent trends (January 2009 to August 2012) in consumption, production and feedstock inputs, imports, exports, prices and producer margins, and infrastructure.

The discussion of consumption issues is framed in terms of the volume percentage of ethanol in gasoline and biodiesel in diesel fuel and heating oil. Volume percentages are important because engines and other equipment may be limited in their ability to use ethanol or biodiesel in proportion to the amount

⁵ Energy Policy Act of 2005, Renewable Fuel Standard and Energy Independence and Security Act of 2007, Renewable Fuel Standard 2 (see Appendix A).

⁶ EPA, Office of Transportation and Air Quality, Fuels and Fuel Additives - E15:
<http://www.epa.gov/otaq/regs/fuels/additive/e15/>

⁷ EPA, Office of Transportation and Air Quality, Fuels and Fuel Additives, *Alphabetical List of Registered E15 Ethanol*,
<http://www.epa.gov/otaq/fuels/registrationfuels/web-e15.htm>.

of petroleum used. This is particularly true in the case of fuel ethanol, which now constitutes nearly 10 percent by volume of every gallon of gasoline sold in the United States.

The discussion of domestic production considers raw material use in biofuels production and the recent drought. The fractions of corn used for ethanol production and soybean oil used for biodiesel production are estimated using data from EIA and the U.S. Department of Agriculture (USDA).

The discussion of imports and exports focuses on Brazil, the world's largest producer of sugarcane-based ethanol. Imports of Brazilian ethanol, the production of which emits fewer greenhouse gases than corn-based ethanol produced in the United States, are expected to help meet the RFS2⁸ advanced biofuels requirements and the California LCFS.

The prices and producer margins section focuses on Iowa because that state is a major producer of ethanol and biodiesel and price information is readily available.

A subsequent section on infrastructure includes information on railroads, pipelines, and service stations enabling the delivery of biofuels.

The report concludes with a discussion of significant biofuels technology developments, focusing on cellulosic biofuels projects and EIA projections.

Four appendices are included:

- Appendix A. Legislation and Regulations

- Appendix B. E85 Sales and Prices

- Appendix C. Assumptions, Calculations, and Data Series

- Appendix D. EIA Estimates Required Under Section 211(o)(3) of the Clean Air Act

⁸ Energy Independence and Security Act of 2007, Renewable Fuel Standard (see Appendix A).

Ethanol Issues and Trends

The United States has been blending ethanol into gasoline since the late 1970s, but only in the last decade or so has ethanol become a significant portion of the gasoline pool. Ethanol was a little over 1 percent of gasoline volume in 2001, but reached nearly 10 percent of domestic gasoline consumption in 2011. Consumption of ethanol in gasoline blends with more than 51 percent ethanol by volume (E85) grew somewhat in 2011, but still accounted for less than one percent of total ethanol produced for motor fuels. Ethanol production reached historically high levels in 2011, but had stopped growing at the rates that had been achieved in prior years due to the saturation of the U.S. gasoline market with 10-percent ethanol blends. Trade with Brazil, the world's other major producer of biofuels, shifted during 2010-11 as the United States became a net exporter of fuel ethanol in 2010 and began importing lower-carbon Brazilian sugarcane ethanol to meet the California LCFS.

Consumption

Ethanol consumption in 2011 reached 12.9 billion gallons, which exceeded the conventional biofuels portion of RFS2.⁹ Over 99 percent of ethanol is consumed as E10, a blend of 10 percent ethanol and 90 percent gasoline by volume. E10 was the maximum ethanol blend allowed for use in most of the vehicle fleet until 2011, when EPA approved the use of 15 percent ethanol blends (E15) in all light-duty vehicles from model years 2001 or later. EPA approval, however, does not address retail outlet liability issues, automobile warranty concerns, and an apparent lack of consumer demand that have together held back any significant sales of E15. Numerous ethanol producers have been approved by EPA to sell their ethanol for blending into E15,¹⁰ but as of August 2012, only one retailer in Kansas had announced that it has E15 for sale.

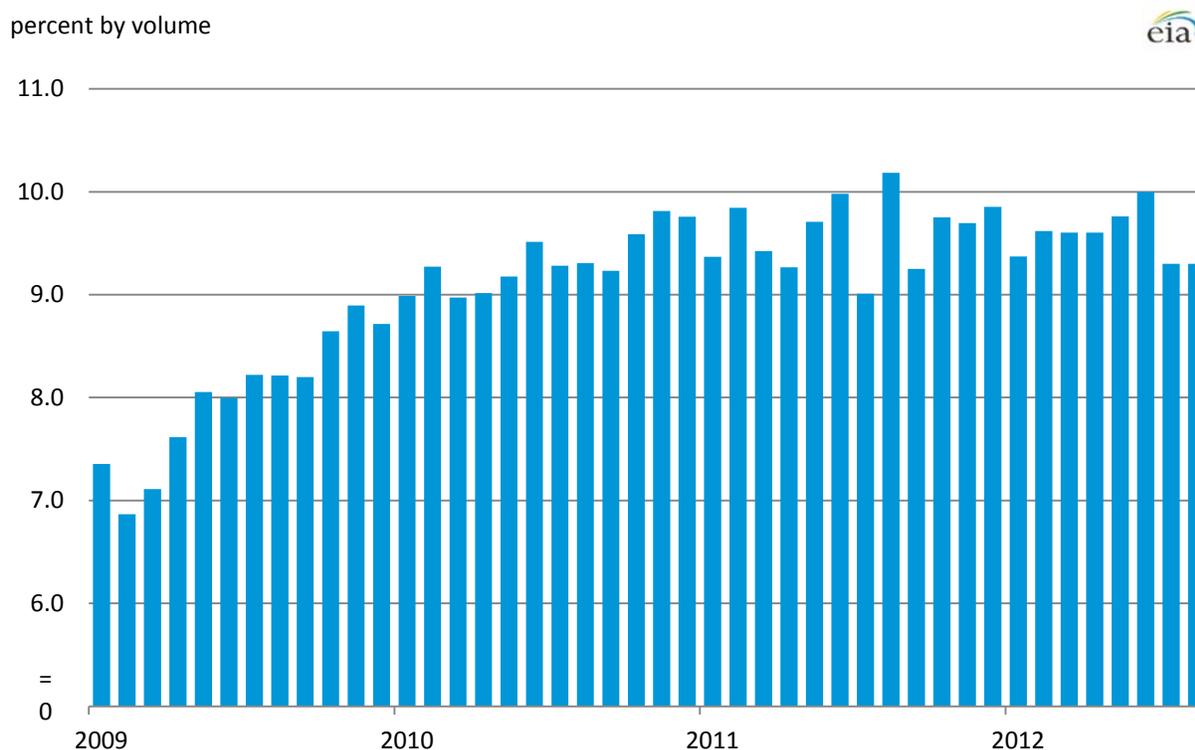
A small amount of ethanol is sold as E85, a blend of 51 to 83 percent ethanol by volume and gasoline. E85 blends with less than 83 percent ethanol are used where and when necessary to ensure that vehicles will start in cold weather.¹¹ EIA collects data for the production of conventional gasoline with more than 55 percent ethanol by volume, which is assumed to be sold as E85. Appendix B provides more details on E85 sales in specific states.

The average concentration of ethanol in the U.S. gasoline supply, including all blends from 0 to 83 percent ethanol, reached 10 percent in June 2011 and peaked at just above 10 percent in August 2011. Figure 1 shows the estimated volume fraction of gasoline that is ethanol. The average concentration of ethanol in gasoline for all of 2011 was 9.6 percent. In 2012, the ethanol content of gasoline grew slightly, averaging an estimated 9.7 percent through the first eight months of the year.

⁹ See Table A-1 in Appendix A. RFS2 volume requirements for 2011: a total of 13.95 billion gallons of renewable fuel, of which 1.35 billion gallons had to be advanced biofuels. Corn ethanol is a conventional biofuel; it cannot qualify as advanced biofuel.

¹⁰ EPA, Office of Transportation and Air Quality, Fuels and Fuel Additives, Alphabetical List of Registered E15 Ethanol, <http://www.epa.gov/otag/fuels/registrationfuels/web-e15.htm>.

¹¹ U.S. Department of Energy (DOE), Alternative Fuels Data Center (AFDC), http://www.afdc.energy.gov/afdc/fuels/ethanol_e85_specs.html.

Figure 1. Ethanol share of U.S. gasoline consumption, 2009-12

Sources: Calculated from EIA, *Monthly Energy Review*, August 2012, Ethanol Consumption, Table 10.3, http://www.eia.gov/totalenergy/data/monthly/query/mer_data_excel.asp?table=T10.03, Motor Gasoline Product Supplied, Table 3.5, http://www.eia.gov/totalenergy/data/monthly/query/mer_data_excel.asp?table=T03.05, and STEO Custom Table Builder.

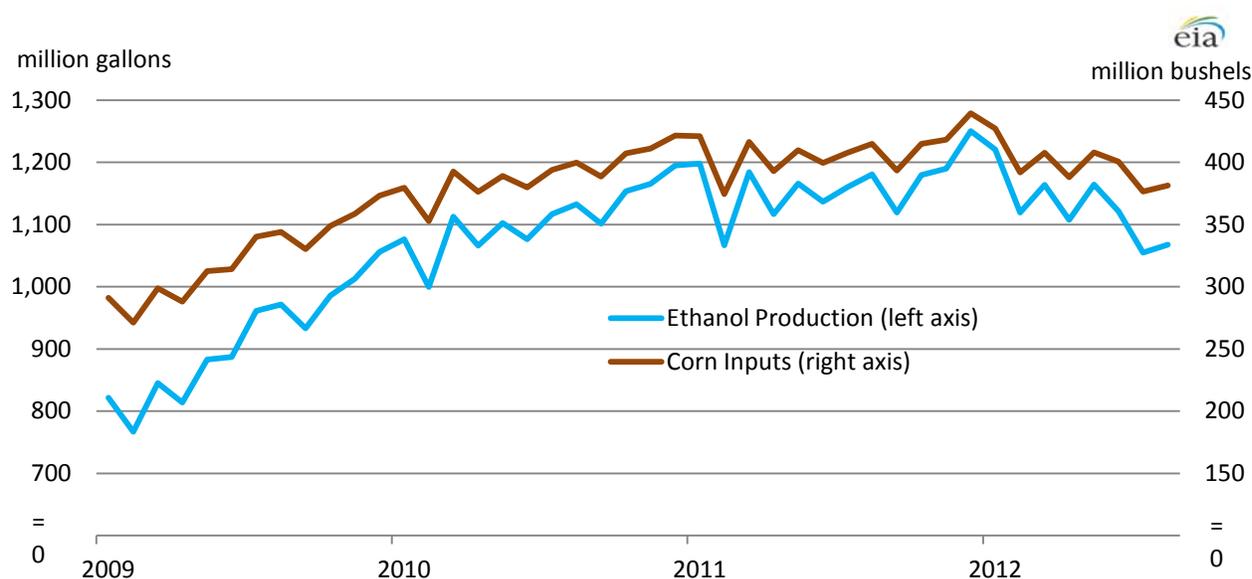
Production

Ethanol production grew consistently from around 800 million gallons per month in the beginning of 2009 to historically high levels of more than 1,100 million gallons per month from January 2011 through July 2012 (Figure 2). Ethanol production stopped growing at the rates of prior years because of the saturation of the U.S. gasoline market with E10 coupled with less-favorable export markets. Nevertheless, ethanol production in 2011 was 13.9 billion gallons, compared to 13.3 billion gallons in 2010. Production, shown in Figure 2, was consistently higher in each month in 2011 than in the same month in both 2009 and 2010.

Nearly every gallon of gasoline in the United States contains 10 percent ethanol by volume, which is the limit for gasoline that is usable in non-flex-fuel vehicles from model years before 2001.¹² Likewise, nearly all ethanol produced in the United States is derived from corn. In the summer of 2012, a major drought across the Midwest, where most of the U.S. corn crop is grown, lowered production estimates for corn and other crops, resulting in higher prices and a reduced forecast for ethanol production. Since May 2012, ethanol production has decreased but is still higher than the monthly average for 2009.

¹² Model year vehicles 2001 and later were granted a waiver by EPA to use up to 15 percent ethanol by volume.

Figure 2. U.S. ethanol inputs and production, 2009-12



Sources: EIA, *Monthly Energy Review*, August 2012, Table 10.3, http://www.eia.gov/totalenergy/data/monthly/query/mer_data_excel.asp?table=T10.03, and EIA, *Short-Term Energy Outlook*, August 2012 (July–August 2012 only), <http://www.eia.gov/forecasts/steo/query/index.cfm?periodType=MONTHLY&startYear=2012&endYear=2012&formulas=1gx29xox104x1>.

Inputs

Corn use for ethanol production was estimated at 4.7 billion bushels (263 billion pounds) in 2010 and 4.9 billion bushels (275 billion pounds) in 2011. Monthly levels of feedstock input to ethanol production are shown in Figure 2. The U.S. Department of Agriculture (USDA) analyzes corn markets over a marketing year, which begins each September 1, around the time that corn is harvested. For the 2010/11 marketing year, USDA reported corn production of 12.4 billion bushels.¹³ Over the same period, EIA estimated that a total of 4.9 billion bushels were used for ethanol production.¹⁴ This meant that 40 percent of the 2010 corn crop was consumed in order to produce ethanol and distillers grains in marketing year 2010/11 (Table 2).

The 2011/12 corn harvest was also about 12.4 billion bushels. In the summer of 2012, however, the Midwest faced a serious drought, which continues. Drastically reduced rainfall and extended periods of triple-digit temperatures throughout the Corn Belt have damaged corn and other crops and stranded river barge traffic, which will have significant impacts on supplies of and prices for animal feed, livestock, meat and dairy products, processed corn products, and ethanol.

¹³ USDA, *World Agricultural Supply and Demand Estimates (WASDE)*, August 10, 2012, page 12, <http://usda01.library.cornell.edu/usda/waob/wasde//2010s/2012/wasde-08-10-2012.pdf>.

¹⁴ EIA, *Monthly Energy Review*, August 2012, Table 10.3, http://www.eia.gov/totalenergy/data/monthly/query/mer_data_excel.asp?table=T10.03. All feedstock is assumed to be corn with gross energy content of 0.392 million Btu per bushel. Feedstock Inputs to Ethanol Production in million bushels = Fuel Ethanol Feedstock / 0.392. All calculations and assumptions are included in Appendix C.

Table 2. Corn production and utilization for ethanol and distillers grains

(billion bushels of corn unless otherwise noted)

Inputs	USDA Marketing Year		
	2009/10	2010/11	2011/12
Corn Production	13.1	12.4	12.4
Corn Use for Production of Ethanol and Distillers Grains	4.5	4.9	4.8
Percentage of Corn Production Used for Production of Ethanol and Distillers Grains	34	40	39

Sources: Corn Crop, 2009/2010: USDA, *WASDE*, April 10, 2012, page 12, <http://usda01.library.cornell.edu/usda/waob/wasde//2010s/2012/wasde-04-10-2012.pdf>; Corn Crop, 2010/11 and 2011/12: USDA, *WASDE*, August 10, 2012, page 12, <http://usda01.library.cornell.edu/usda/waob/wasde//2010s/2012/wasde-08-10-2012.pdf>; Corn Use for Ethanol Production: EIA, *Monthly Energy Review*, August 2012, Table 10.3, http://www.eia.gov/totalenergy/data/monthly/query/mer_data_excel.asp?table=T10.03, and EIA, *Short-Term Energy Outlook*, August 2012 (June –August 2012 only), <http://www.eia.gov/forecasts/steo/query/index.cfm?periodType=MONTHLY&startYear=2012&endYear=2012&formulas=1gx29xox104x1>. See Appendix C for conversion factors for ethanol feedstocks.

USDA reported that 66 percent of the nation’s corn crop was rated as good or excellent as of June 10, 2012.¹⁵ Farmers had taken advantage of the relatively warm winter and planted corn early, looking toward a record harvest projected at 14.8 billion bushels. On July 13, 2012, USDA reported that the drought had caused the total projected corn harvest to fall to 13.0 billion bushels, 12 percent lower than previously expected. By July 30, 2012, the portion of the U.S. corn crop rated good or excellent had fallen to 26 percent.¹⁶

The U.S. Drought Monitor, a joint publication of USDA and the National Oceanic and Atmospheric Administration (NOAA), reported that large areas of the Midwest and Great Plains regions, which are substantial corn-producing areas, are experiencing significant drought conditions. Drought conditions are rated as D0 (abnormally dry), D1 (moderate), D2 (severe), D3 (extreme), or D4 (exceptional). Drought Monitor data through July 2012 revealed that 88 percent of the U.S. corn crop was located within a drought area, with 40 percent experiencing D3 and D4 drought levels.¹⁷ By August 15, counties in 31 states were designated drought disaster areas.¹⁸ The USDA has further reduced its projection of the 2012/13 corn crop from 13.0 billion bushels to 10.7 billion bushels, the lowest level since 2006/07.¹⁹

¹⁵ USDA, Feed Outlook for June 2012, <http://www.ers.usda.gov/media/815354/fds12f.pdf>.

¹⁶ USDA, Feed Outlook for July 2012, <http://www.ers.usda.gov/media/853726/fds12g.pdf> and USDA, National Agricultural Statistics Service, Crop Progress, <http://usda01.library.cornell.edu/usda/nass/CropProg//2010s/2012/CropProg-07-30-2012.pdf>.

¹⁷ USDA, Agricultural Weather and Drought Update, August 3, 2012, <http://blogs.usda.gov/2012/08/03/agricultural-weather-and-drought-update-%e2%80%93-8312/#more-41648>.

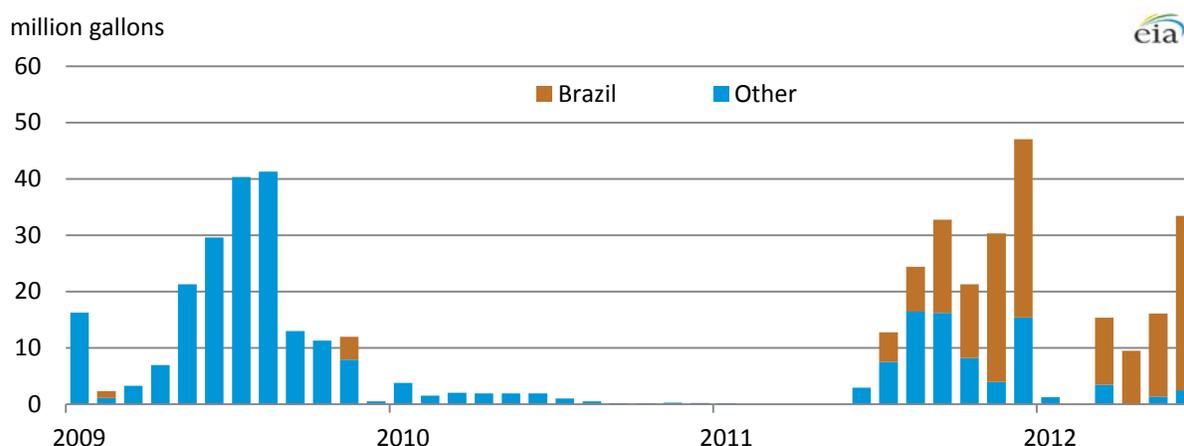
¹⁸ USDA Farm Service Agency, “2012 Secretarial Drought Designations - All Drought,” September 5, 2012, <http://www.usda.gov/documents/usda-drought-fast-track-designations-090512.pdf>.

¹⁹ USDA, National Agricultural Statistics Service, Crop Production, September 12, 2012, <http://usda01.library.cornell.edu/usda/current/CropProd/CropProd-09-12-2012.pdf>

Imports and Exports

U.S. imports of ethanol have fallen significantly from their peak in 2006, remaining below 50 million gallons per month since 2009 (Figure 3). After transitioning from a net importer of ethanol to a net exporter during 2010, the United States exported record levels of ethanol and nearly ceased imports. A number of factors, both domestic and foreign, will influence the U.S. ethanol trade balance moving forward. Sluggish gasoline demand, combined with ethanol blending limits also known as the ethanol blend wall, are currently restraining domestic consumption levels while requirements have increased under the RFS2. In addition, sugarcane ethanol imported from Brazil looks to rebound from a low year in 2011 and compete with U.S. corn ethanol in the world market.

Figure 3. U.S. gross imports of ethanol, 2009-12



Source: EIA, U.S. Imports of Fuel Ethanol by Destination, http://www.eia.gov/dnav/pet/PET_MOVE_IMPCUS_A2_NUS_EPOOXE_IM0_MBBL_M.htm.

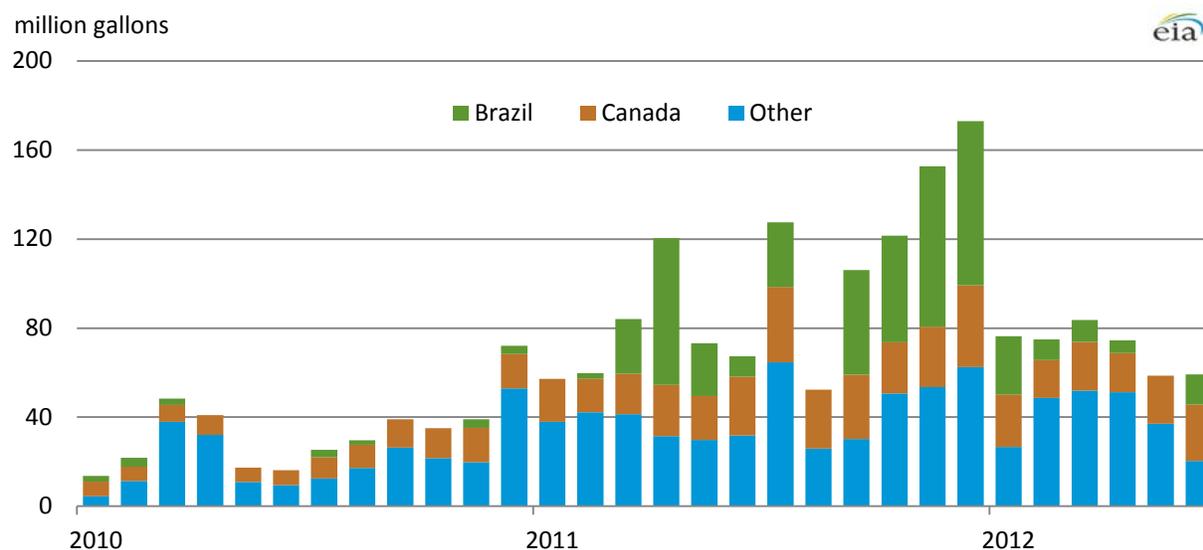
During 2011, the United States exported record levels of ethanol – a total of approximately 1.2 billion gallons, compared to almost 400 million gallons in 2010 (Figure 4). Brazil was the largest recipient of U.S. ethanol in 2011, importing 400 million gallons compared to approximately 20 million gallons in 2010; significant volumes of ethanol were also sent to Canada, Europe, and the United Arab Emirates. The largest factor driving the ramp-up in U.S. ethanol exports has been the combination of increased ethanol production capacity in the United States with limited market for blends greater than E10. Export markets have created an outlet for the majority of these marginal ethanol volumes.

The RFS2 advanced biofuels volume requirements, for which imported sugarcane ethanol along with biomass-based biodiesel qualifies, increased to 2.0 billion gallons in 2012 from 1.35 billion gallons in 2011. The specific interactions between the markets for the different qualifying fuels and the RFS2

create opportunities for an ethanol swap between the United States and Brazil in 2012. In this scenario, the United States sends Brazil volumes of corn ethanol in exchange for Brazilian sugarcane ethanol, which draws a higher price in the United States because of the RFS2 advanced biofuels requirements as well as the California LCFS program. This dynamic results in a complex environment in which RFS-regulated parties and ethanol producers not only have to produce enough ethanol to meet the overall RFS2, but likely must also import significant volumes of sugarcane ethanol to meet those narrower

specifications, all in the face of demand constraints by way of the ethanol blend wall. At this point, considering all factors, the United States is likely to be a net exporter of ethanol in 2012, albeit at lower levels than in 2011. The trade balance is likely to be directly tied to Brazil as a result of the RFS2 (and LCFS), with gasoline demand, E15 adoption, and even the biodiesel market influencing the total volumes.

Figure 4. U.S. gross exports of ethanol, 2010-12



Source: EIA, U.S. Exports of Fuel Ethanol by Destination,

http://www.eia.gov/dnav/pet/pet_move_expc_a_EPOOXE_EEX_mbbldpd_m.htm. Data from 2009 is not available.

The Brazilian ethanol market is driven by government policy and price. The range for ethanol blending in gasoline was between 20 and 25 percent until April 2011, when the minimum volume was lowered to 18 percent in anticipation of the reduced availability of ethanol.²⁰ Brazilian fuel ethanol production decreased in 2011 by 18 percent from 2010 due to a weather-related reduction in sugarcane yields. In October 2011, the government dropped the maximum percentage of ethanol blending from 25 to 20 percent.²¹ Brazil reduced its exports of ethanol and turned to imports, primarily from the United States, to make up for the reduced production.

About half of Brazil's light-duty vehicles, including some ethanol-only vehicles and a much larger number of flex fuel vehicles capable of using a full range of ethanol blends including pure ethanol. If the price of ethanol is less than 70 percent of the price of ethanol-blended gasoline, drivers of flex fuel vehicles will generally choose to fill up with pure ethanol. Throughout 2009, ethanol prices in nine sample locations were nearly always lower than ethanol-blended gasoline prices, and Brazilian drivers consumed about one gallon of ethanol for every 1.5 gallons of ethanol-blended gasoline. From 2010 through the middle of 2012, however, the price of ethanol rose in relation to the price of ethanol-blended gasoline in most places. As a result, the ratio declined to one gallon of ethanol for every 3.3 gallons of ethanol-blended

²⁰ USDA, Foreign Agricultural Service, *Brazil Biofuels 2011*, page 2, http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Sao%20Paulo%20ATO_Brazil_7-27-2011.pdf.

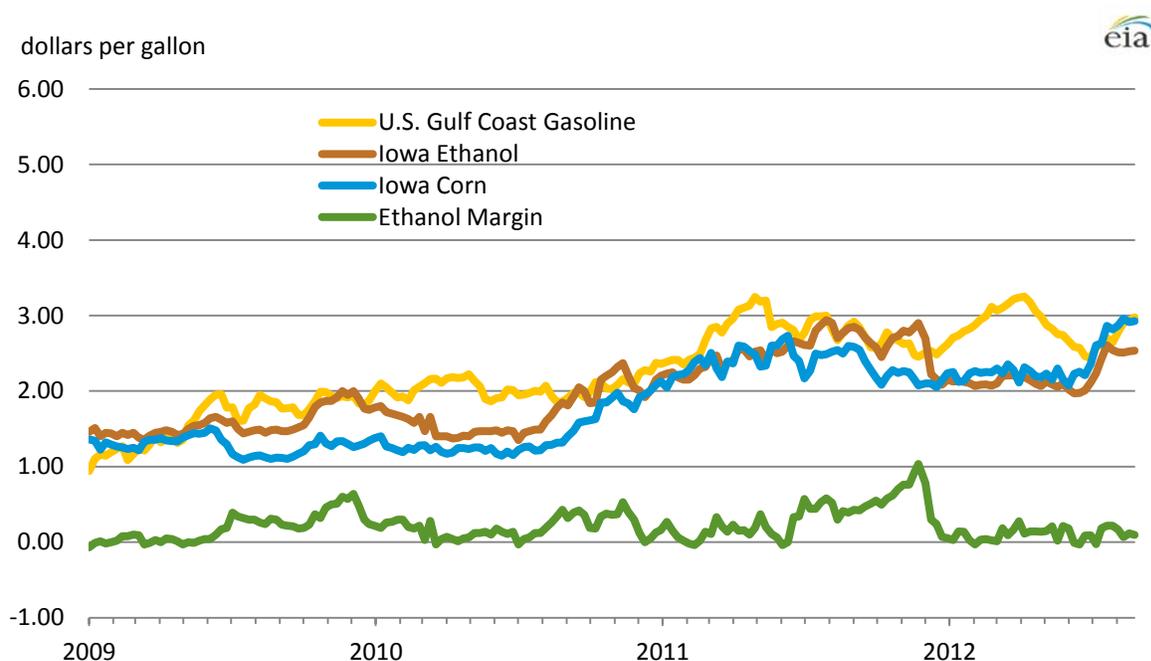
²¹ USDA Foreign Agriculture Service, *Brazil Biofuels 2012*, pages 3 and 8, http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Sao%20Paulo%20ATO_Brazil_8-21-2012.pdf.

gasoline in 2011 and has declined further to one gallon of pure ethanol for every 4.1 gallons of ethanol-blended gasoline in the first four months of 2012.

Prices and Producer Margins

The ethanol margin is calculated as the sum of the ethanol price and the co-product value of dried distillers grains (a byproduct of most ethanol production) minus the sum of the cost of the corn and natural gas used plus a fixed operating cost of \$0.35 per gallon. Iowa wholesale ethanol prices steadily climbed from around \$2.00 per gallon in early 2011 to around \$3.00 per gallon in the latter part of 2011, compared with prices at or below \$2.00 per gallon for most of 2010 (Figure 5).

Figure 5. Ethanol prices and margins, 2009-12



Sources: Calculated from USDA Agricultural Marketing Service, *National Weekly Ethanol Summary* <http://www.ams.usda.gov/mnreports/LSWEthanol.pdf>; Thomson-Reuters Henry Hub natural gas prices, <http://www.eia.gov/dnav/ng/hist/rngwhhdd.htm>; Weekly U.S. Gulf Coast Conventional Gasoline Regular Spot Price FOB, http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EER_EPMRU_PF4_RGC_DPG&f=W. See Appendix C.

The estimated margins for Iowa ethanol producers remained below \$0.60 per gallon for most of 2009 and 2010. Corn prices held at \$3.00-\$4.00 per bushel before reaching \$6.00 per bushel by the end of 2010. Iowa corn prices started 2011 around \$6.00 per bushel, increasing to highs of more than \$7.50 per bushel in June before falling back down around \$6.00 per bushel to finish the year, as shown in Figure 5. Because corn prices are a large component of ethanol production costs, lower ethanol prices combined with higher corn prices in the early half of the year led to many weeks of suppressed operating margins. In the last half of 2011, Iowa ethanol producer margins grew from slightly negative levels to exceed \$1.00 per gallon in mid-November, and then fell dramatically by year-end. Ethanol producers raised production levels in response to increased blender demand to capture the expiring

VEETC, also known as the ethanol blender's tax credit. Margins fell once that extra demand was satisfied.²²

Iowa wholesale ethanol prices dropped sharply at the end of 2011 (Figure 5), likely in response to the significant ramp-up in production in December focused on taking advantage of the looming expiration of the \$0.45-per-gallon ethanol blender's tax credit at the end of the year. However, during the first half of 2012, U.S. ethanol was still competitively priced globally, leading to consistently high production and significant volumes of exports worldwide.²³

After several months of relative stability, the drought caused ethanol spot prices to rise from around \$2.00 per gallon in mid-June 2012 to reach a peak during the first eight months of \$2.61 per gallon on July 25, 2012. In addition, weekly ethanol production rates fell rapidly from 38 million gallons per day in May and June to 33 million gallons per day during the week of July 20, 2012, the lowest level since EIA began collecting weekly ethanol production data in 2010.²⁴ Even after the recent sharp increase in ethanol prices and the drop in ethanol output, Iowa ethanol was still selling at around a \$0.10-per-gallon discount to Gulf Coast conventional gasoline, which averaged \$2.64 per gallon in July 2012.²⁵ As of the week of August 31, 2012, ethanol prices had stabilized, although the longer-term impacts of the drought remain uncertain.

Infrastructure

The wholesale distribution infrastructure for ethanol has developed to the point that nearly every gallon of gasoline consumed in the United States is blended with ethanol. Recent investments in ethanol distribution have been geared toward efficiency improvements, such as larger rail terminals or pipelines, rather than first-time delivery of ethanol into a geographic market.

Most ethanol leaves the production plant on trains. Rail shipment is most efficient when a train of approximately 100 cars, called a unit train, is loaded entirely with ethanol and sent to a single destination. Over the last few years, the development of unit train terminals has been focused on the Northeast, California, and Texas. Rail terminal upgrades to handle unit trains at ethanol distribution facilities in Denton, North Carolina, and Birmingham, Alabama, were announced in 2011.²⁶ The

²² Ben Lefebvre, "U.S. ethanol stocks rise, demand falls," Dow Jones, February 21, 2012,

http://www.agriculture.com/markets/analysis/corn/us-ethol-stocks-rise-dem-falls_9-ar22400?print.

²³ EIA, "U.S. Renewable Fuels Plant and Oxygenate Plant Net Production of Ethanol,"

http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=M_EPOOXE_YNP_NUS_MBBL&f=M, and

EIA, "U.S. Exports of Fuel Ethanol," http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=M_EPOOXE_EEX_NUS-Z00_MBBL&f=M.

²⁴ EIA, Weekly U.S. Oxygenate Plant Production of Fuel Ethanol, simple average of weeks ending May 4, 2012 through June 29, 2012, reported value for week ending July 20, 2012,

http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=W_EPOOXE_YOP_NUS_MBBLD&f=W.

²⁵ Weekly U.S. Gulf Coast Conventional Gasoline Regular Spot Price FOB,

http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EER_EPMRU_PF4_RGC_DPG&f=W. Simple average of weeks ending July 6, 2012 through July 27, 2012.

²⁶ "Eco-Energy to develop ethanol unit train," *Bulk Transporter*, Sept. 7, 2011,

<http://bulktransporter.com/management/shippers/eco-energy-ethanol-unit-train-0907/>; and Green Plains Renewable Energy press release, Feb. 9, 2012, <http://ethanolproducer.com/articles/8549/green-plains-revenues-up-1-5-billion>.

Birmingham facility is expected to begin operation in October 2012.²⁷ The Denton terminal started operation in May 2012, and the developer announced plans for ethanol unit train terminals in Dumfries, Virginia, and Cartersville, Georgia.²⁸

Pipelines are potentially the most efficient way to transport ethanol, but there are several practical problems. The U.S. petroleum product pipeline system is primarily designed to move products from refineries in the Gulf Coast to consuming regions in the Northeast and the Midwest. Nearly all ethanol is produced in the Midwest and must be delivered to gasoline bulk terminals nationwide. Under normal operations, petroleum product pipelines often have hydrocarbon residues and small amounts of water in them. Ethanol, a strong solvent, can dissolve both residues and water thereby arriving at its destination out of specification.

Since 2009, Kinder Morgan has successfully transported ethanol in batches from Tampa to Orlando on its Central Florida pipeline system. The pipeline, while relatively short and without the complications of many other product pipelines, needed special cleaning and material upgrades prior to the start of shipping ethanol. In addition, each batch of ethanol is treated with anticorrosion additives to prevent corrosion of the steel pipes.²⁹ In 2011, Kinder Morgan, the Tampa Port Authority, and CSX announced plans to upgrade the rail infrastructure to handle unit trains.³⁰ The Kinder Morgan line remains the only multiproduct pipeline shipping ethanol.³¹ Currently there are no dedicated pipelines for ethanol in the United States.

E10 can be sold at service stations from any existing pump. Widespread use of E15 or E85 will require that existing service station pumps, storage tanks, and other associated systems be upgraded or replaced. Retailers may dedicate pumps to E15 or E85, or they may install blender pumps for additional flexibility. Blender pumps draw from a tank of clear gasoline³² or E10 and from a tank of E85 and can dispense either fuel directly or combine the two fuels to make intermediate ethanol blends such as E15, E20, or E30. There are several hundred of these pumps in operation in the United States.³³

²⁷ Green Plains Renewable Energy press release, "Birmingham Construction Update", September 14, 2012, <http://www.gpreinc.com/News>.

²⁸ "Eco-Energy to add Virginia to its ethanol facilities in the East," *Ethanol Producer*, August 1, 2012, <http://ethanolproducer.com/articles/8989/eco-energy-to-add-virginia-to-its-ethanol-facilities-in-the-east> and "Eco-Energy to build Atlanta center, NC center to start up May 5," *Ethanol Producer*, April 10, 2012, <http://ethanolproducer.com/articles/8701/eco-energy-to-build-atlanta-center-nc-center-to-start-up-may-5>.

²⁹ DOE AFDC, "Kinder Morgan Central Florida Pipeline Ethanol Project," http://www.afdc.energy.gov/afdc/pdfs/km_cfpl_ethanol_pipeline_fact_sheet.pdf.

³⁰ "KMEP, partners to develop train-to-pipeline ethanol distribution," *Oil and Gas Journal*, Sept. 19, 2011, <http://www.ogj.com/articles/2011/09/kmep-partners-to-develop-train-to-pipeline-ethanol-distribution.html>.

³¹ Pipeline operator Magellan Midstream Partners and ethanol producer POET were planning to construct an ethanol pipeline from South Dakota to New York Harbor. Magellan withdrew from the partnership in 2011. The partners had hoped for a federal loan guarantee similar to those offered to cellulosic biofuel production facilities, but it was subsequently determined that no existing federal programs were applicable. Several proposals were offered in Congress in 2011, but none was acted upon. OPIS, "Biofuels Update: Spokesman: Magellan No Longer Pursuing Dedicated Ethanol Pipeline Project," Oct. 11, 2011.

³² "Clear gasoline" is a petroleum industry term for finished gasoline that does not contain ethanol.

³³ DOE AFDC, "Blender Pump Dispensers," Feb. 28, 2011, http://www.afdc.energy.gov/afdc/technology_bulletin_0210.html.

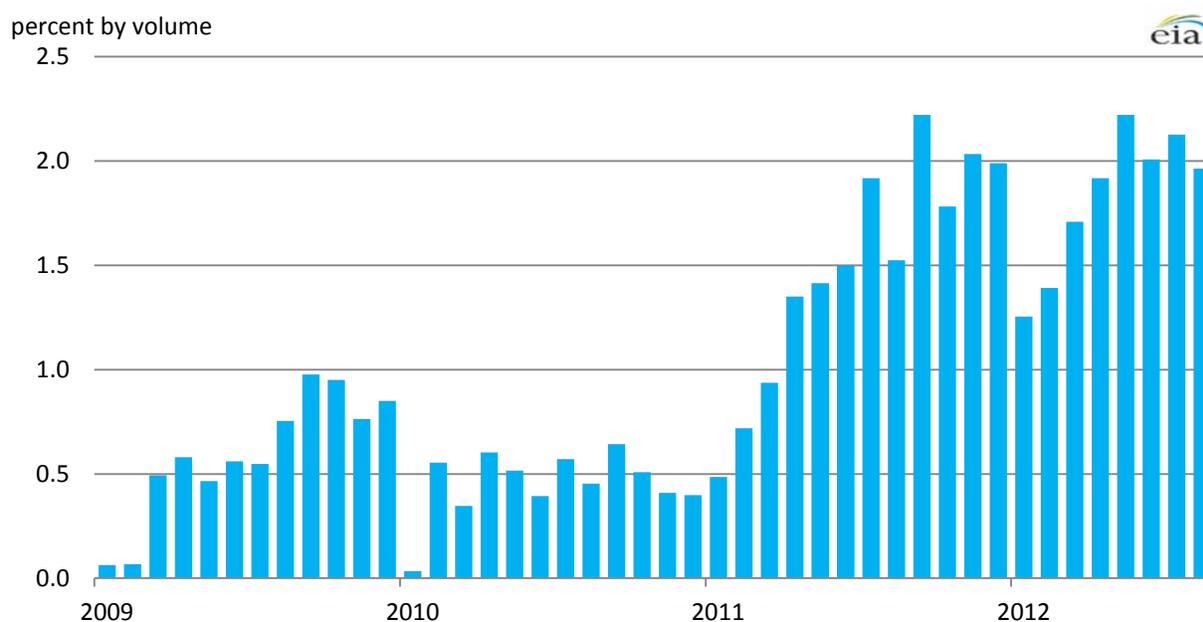
Biodiesel Issues and Trends

Commercial production of biodiesel began in the United States in 2001 when 9 million gallons were produced primarily from soybean oil. Like the ethanol industry, the biodiesel industry has grown quickly in the last decade. Biodiesel production in 2011 was more than 100 times its 2001 level. Unlike the ethanol industry, the biodiesel industry has room to grow without major changes to existing regulations and vehicles. Biodiesel made up less than 1 percent of diesel fuel and heating oil consumption in 2009, growing to 1.5 percent in 2011. The United States has exported more biodiesel than it imported in the last decade. That may change as more biodiesel is consumed in domestic markets to comply with the RFS2 and other regulations.

Consumption

Biodiesel consumption grew from 326 million gallons in 2009 to 878 million gallons in 2011, after having declined in 2010. Figure 6 shows the estimated volume fractions of biodiesel in the total supply of distillate fuel, which consists of all diesel fuel and heating oil. Biodiesel's share of all distillate peaked at 2.2 percent in September 2011, far below the 5 percent by volume that is approved for use in all diesel engines.³⁴ The biodiesel share of distillate is higher in 2012 than during the same period in 2011; the year-to-date peak was 2.2 percent in May.

Figure 6. Biodiesel share of U.S. distillate consumption, 2009-12



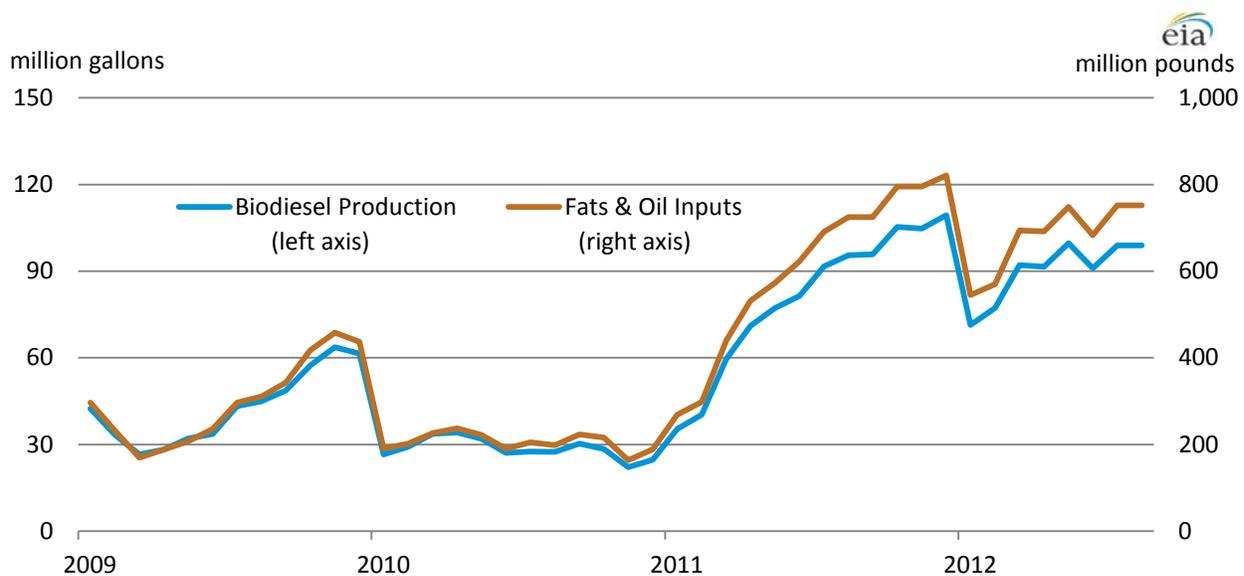
Sources: Calculated from EIA, *Monthly Energy Review*, August 2012, Biodiesel Consumption, Table 10.4, http://www.eia.gov/totalenergy/data/monthly/query/mer_data_excel.asp?table=T10.04, Distillate Fuel Oil Product Supplied, Table 3.5, http://www.eia.gov/totalenergy/data/monthly/query/mer_data_excel.asp?table=T03.05, and STEO Custom Table Builder.

³⁴DOE AFDC, "Biodiesel Blends," http://www.afdc.energy.gov/afdc/fuels/biodiesel_blends.html.

Production

Biodiesel production in 2010 was lower than any year since 2006, but it recovered strongly in 2011 (Figure 7). In 2009, biodiesel production totaled 516 million gallons. In 2010, the production of biodiesel fell to 343 million gallons, or 34 percent below the level in 2009, partly due to the expiration of the biodiesel tax credit at the end of 2009. A reinstatement of the credit retroactive to the beginning of 2010 was passed late in 2010, which helped the biodiesel industry recover and increase production in 2011. Toward the end of 2011, demand for biodiesel also increased as fuel blenders needed to meet an increased RFS2 volume of 1 billion gallons of biomass-based diesel. EIA estimates biodiesel production reached 967 million gallons for 2011, more than 180 percent higher than in the prior year. Thus far in 2012, biodiesel production has remained largely at 2011 levels, reaching a total of 523 million gallons through June 2012.

Figure 7. U.S. Biodiesel inputs and production, 2009-12



Source: EIA, *Monthly Energy Review*, August 2012, Table 10.4,

http://www.eia.gov/totalenergy/data/monthly/query/mer_data_excel.asp?table=T10.04

EIA, *Short-Term Energy Outlook*, August 2012 (July-August 2012 only),

<http://www.eia.gov/forecasts/steo/query/index.cfm?periodType=MONTHLY&startYear=2012&endYear=2012&formulas=1gx29>

[xox104x1](http://www.eia.gov/forecasts/steo/query/index.cfm?periodType=MONTHLY&startYear=2012&endYear=2012&formulas=1gx29). EIA, *Monthly Biodiesel Production Report*, June 2012, Tables 3 and 3a,

<http://www.eia.gov/biofuels/biodiesel/production/>.

Inputs

The use of vegetable oil and animal fat for biodiesel production was 3.3 billion pounds in 2009, 2.5 billion pounds in 2010, and 7.3 billion pounds in 2011. Year-to-date use of vegetable oil and animal fat for biodiesel in 2012 is 3.9 billion pounds through June (Figure 7). The annual total includes 1.1 billion pounds of soybean oil in 2010 and 4.2 billion pounds in 2011.³⁵

³⁵ EIA, *Monthly Biodiesel Production Report*, June 2012, Tables 3 and 3a, <http://www.eia.gov/biofuels/biodiesel/production/>.

The marketing year for soybean oil begins each October 1; USDA estimates soybean oil production of 18.9 billion pounds for 2010/11.³⁶ Between October 2010 and September 2011, total biodiesel feedstock use was 5.4 billion pounds, of which 2.7 billion pounds were soybean oil.³⁷ This implies that 14 percent of soybean oil production was used for biodiesel, while the remainder was used for food or other chemical or industrial applications.

Total soybean oil production is projected by USDA to increase to 19.6 billion pounds in 2011/12. Total biodiesel feedstock use is projected at 8.6 billion pounds between October 2011 and September 2012. Of this total, 5.2 billion pounds are projected to be soybean oil, implying that 27 percent of soybean oil production will be used for biodiesel.³⁸

The Midwest drought, however, is expected to affect the soybean crop for the 2012/13 marketing year. In August 2012, USDA reduced its projection of soybean oil production to 17.3 billion pounds from 18.4 billion pounds.³⁹ This expected loss in production may cause biodiesel producers to shift away from soybean oil in favor of other vegetable oils or animal fats.

Imports and Exports

The United States has imported and exported biodiesel in every month since EIA started reporting in 2001. Gross import volumes peaked in August and September 2008 at slightly above 38 million gallons in each month, and have exceeded 10 million gallons in only two months since 2008 (Figure 8). U.S. biodiesel imports exceeded exports only twice since 2008, in March 2009 and December 2011.

Since 2007, the United States has generally been a net exporter of biodiesel. But exports began to trend downward in 2010, as more domestically-produced biodiesel was used for domestic consumption to meet the biomass-based diesel portion of the RFS2. New European Union rules⁴⁰ to discourage imports of biodiesel that had received the U.S. blending tax credit are also a factor.

During 2011, Brazil made progress on the introduction of biodiesel to its liquid fuel supply. While biodiesel use is much smaller than ethanol use, Brazil mandated its diesel supply contain 5 percent biodiesel by volume. Brazil's primary source for biodiesel is soybean oil. In contrast to its ethanol industry, Brazil's biodiesel industry managed to grow in 2011 to 706 million gallons, from 630 million gallons in 2010.⁴¹ Import and export volumes are small in relation to production at a few million gallons per year.

³⁶ USDA, *WASDE*, August 10, 2012, page 15, <http://usda01.library.cornell.edu/usda/waob/wasde//2010s/2012/wasde-08-10-2012.pdf>.

³⁷ EIA, *Monthly Biodiesel Production Report*, Tables 3 and 3a, <http://www.eia.gov/biofuels/biodiesel/production/>. It is assumed that 7.65 lbs of soybean oil are used for each gallon of biodiesel.

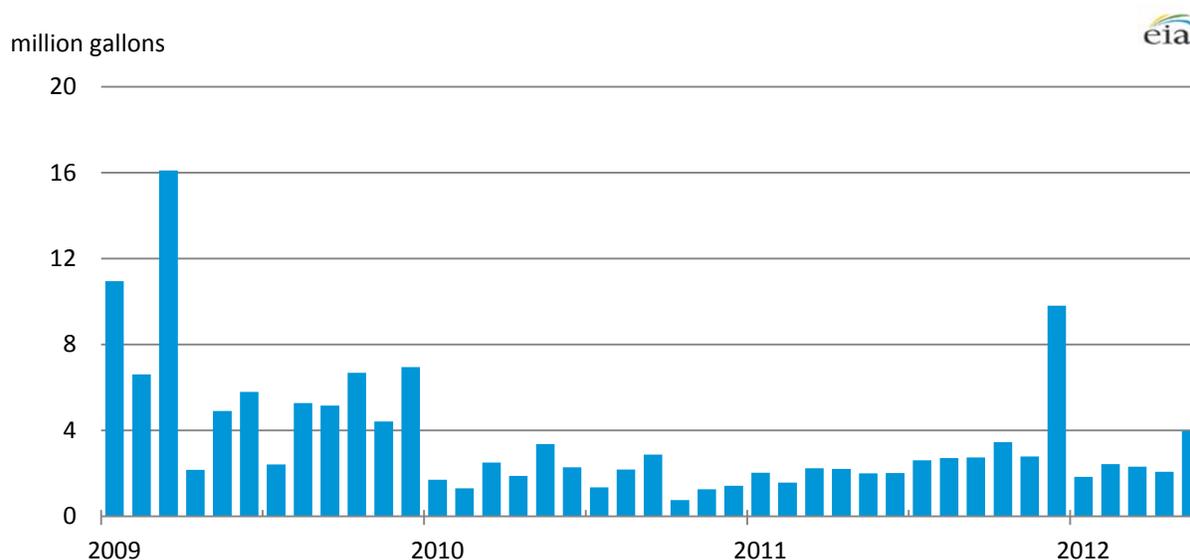
³⁸ See Appendix C for assumptions and calculations.

³⁹ USDA, *WASDE*, August 10, 2012, page 15, <http://usda01.library.cornell.edu/usda/waob/wasde//2010s/2012/wasde-08-10-2012.pdf>.

⁴⁰ "EU biodiesel tariffs begin," *Biodiesel Magazine*, March 9, 2009, <http://www.biodieselmagazine.com/articles/3338/eu-biodiesel-tariffs-begin> and "EC launches anti-circumvention investigation," August 17, 2010, <http://www.biodieselmagazine.com/articles/4336/ec-launches-anti-circumvention-investigation>.

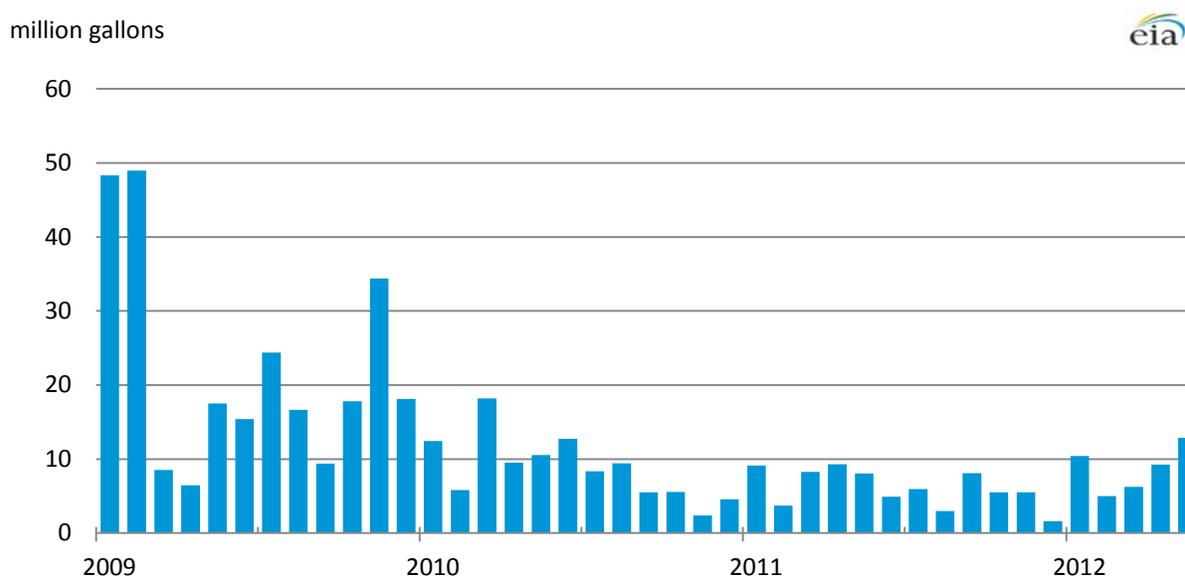
⁴¹ USDA, Foreign Agricultural Service, *Brazil Biofuels 2012*, page 19, http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Biofuels%20Annual_Sao%20Paulo%20ATO_Brazil_8-21-2012.pdf.

Figure 8. U.S. gross imports of biodiesel, 2009-12



Source: EIA, *Monthly Energy Review*, August 2012, Biodiesel Imports, Table 10.4, http://www.eia.gov/totalenergy/data/monthly/query/mer_data_excel.asp?table=T10.04

Figure 9. U.S. gross exports of biodiesel, 2009-12



Source: EIA, *Monthly Energy Review*, August 2012, Biodiesel Exports, Table 10.4, http://www.eia.gov/totalenergy/data/monthly/query/mer_data_excel.asp?table=T10.04.

Although the quantity was small, the United States was the largest single provider of Brazil's biodiesel imports in 2010. U.S. biodiesel exports to Brazil doubled in 2011, but Germany was the largest provider of Brazil's biodiesel imports in that year. The majority of U.S. biodiesel exports since 2011 have gone to Europe, Canada, India, and China. Monthly gross exports of biodiesel to all recipients are shown in Figure 9.

Prices and Producer Margins

The biodiesel margin is calculated as the biodiesel price plus \$0.03 per gallon for glycerine produced as a byproduct minus the sum of the soybean oil, methanol, and a fixed operating cost of \$0.25 per gallon. No cost of capital is included in the estimated margins. Biodiesel producer margin calculations are described in Appendix C.

RINs for the biomass-based diesel component of RFS2 have become especially important to biodiesel producers. The RFS2 compliance mechanism offers an economic incentive to producers of renewable fuel to achieve the mandated levels. Refiners and petroleum product importers demonstrate compliance with the RFS2 through the submission of RINs that are generated by the production of qualifying renewable fuels. Fuel blenders may separate RINs from physical volumes of renewable fuel and subsequently sell any RINs above the quantity needed to meet their individual requirement. Thus, RINs act as tradable credits that can offset any cost disadvantage renewable fuels may have over comparable petroleum products in order to achieve the required levels of consumption.

Biodiesel RIN prices averaged \$0.75 per gallon in 2011.⁴² Because each gallon of biodiesel generates 1.5 RINs due to the ethanol equivalence factor specified in the RFS2, a \$0.75-per-gallon RIN value meant that diesel blenders received an average \$1.13-per-gallon offset against the price of each gallon of biodiesel blended in excess of the obligated quantity. These RIN values combined with the \$1.00-per-gallon tax credit encouraged greater volumes of consumption even though wholesale biodiesel was priced at a large premium to wholesale petroleum diesel. The RIN values plus the tax credit encouraged production of more than 100 million gallons in each month of the last quarter of 2011.⁴³

Iowa wholesale biodiesel prices climbed from around \$4.50 per gallon in the early part of 2011 to highs approaching \$6.00 per gallon in September and October, as shown in Figure 10.⁴⁴ Soybean oil, which provided 57 percent of the feedstock to U.S. biodiesel producers in 2011,⁴⁵ experienced prices that hovered around \$0.50 per pound for most of 2011. These consistent feedstock costs led to increasingly favorable biodiesel producer margins throughout the year. Iowa soybean-based biodiesel margins grew from barely breaking even in early 2011 to highs approaching \$1.50 per gallon in the fourth quarter of 2011, only to fall below \$0.40 per gallon in the first half of 2012.

Infrastructure

Biodiesel distribution is very similar to ethanol distribution. Most biodiesel is shipped from the production plant by rail because biodiesel plants are not necessarily located near pipelines. Where they are permitted, low blends of biodiesel can be shipped on existing pipelines without product degradation. But, like ethanol, biodiesel blends are mostly prohibited from petroleum product pipelines. Most product pipelines that ship diesel fuel also ship jet fuel, in which trace quantities of biodiesel are not currently acceptable. Some exceptions include Kinder Morgan, which allows biodiesel blends on its Plantation system from Mississippi to Virginia and also on its Oregon Pipeline, and the

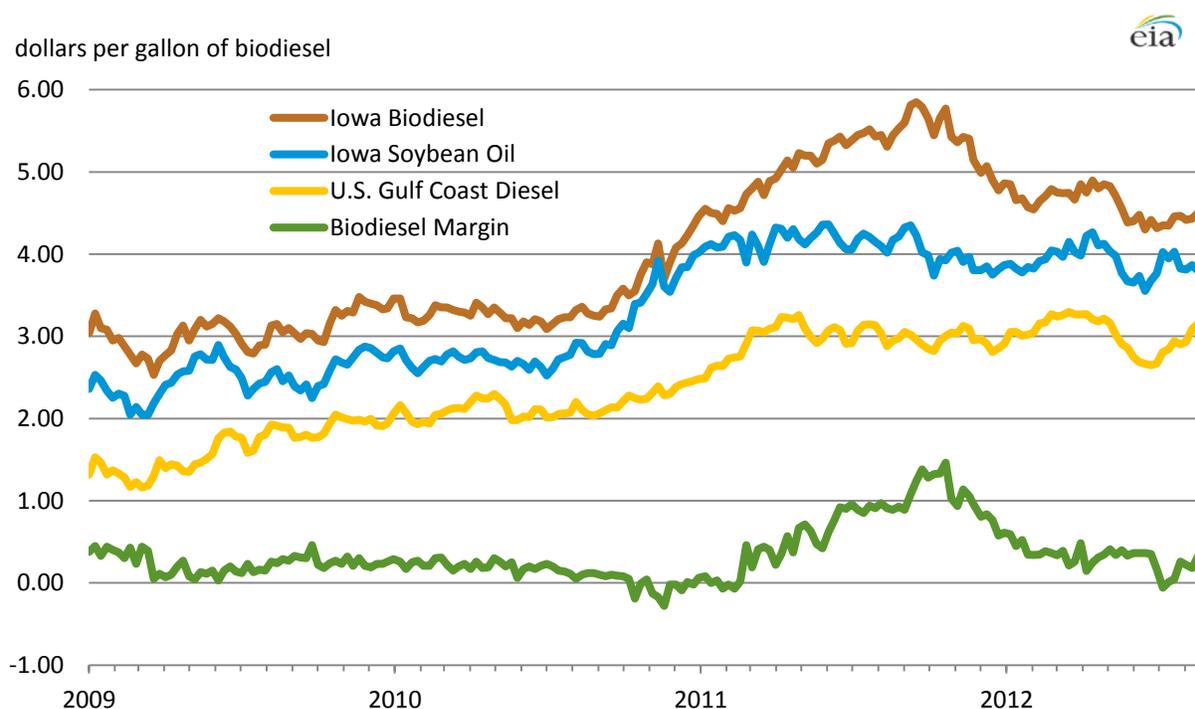
⁴² Daily RIN prices as published by OPIS.

⁴³ EIA, *Monthly Biodiesel Production Report*, Table 1, <http://www.eia.gov/biofuels/biodiesel/production/>.

⁴⁴ USDA Agricultural Marketing Service, National Weekly Ag Energy Roundup, <http://www.ams.usda.gov/mnreports/LSWAgEnergy.pdf>.

⁴⁵ EIA, *Monthly Biodiesel Production Report*, Tables 3 and 3a, <http://www.eia.gov/biofuels/biodiesel/production/>.

Figure 10. Biodiesel prices and margins, 2009-12



Sources: Calculated from USDA Agricultural Marketing Service, National Weekly Ag Energy Roundup, <http://www.ams.usda.gov/mnreports/LSWAgEnergy.pdf>; National Weekly Ag Energy Roundup and Methanex historical methanol prices, http://www.methanex.com/products/documents/MxAvgPrice_Feb282012.pdf. EIA, Weekly U.S. Gulf Coast Ultra-Low-Sulfur No. 2 Diesel Spot Price, http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EER_EPD2DXL0_PF4_RGC_DPG&f=W. See Appendix C.

Colonial Pipeline, which allows biodiesel blends on a portion of its system in Georgia.⁴⁶ Pipeline shipments of biodiesel blends are likely to increase if an allowance for minimal amounts of biodiesel in jet fuel is developed. Heated systems may be necessary at pipeline origin and delivery points to handle biodiesel in cold weather.

The existing retail infrastructure appears able to accommodate additional biodiesel product without modification. Low blends of biodiesel can be sold from any pump. New or upgraded pumps are needed only for biodiesel blends above B20. The number of stations selling B20 continues to grow, from 637 at the end of January 2012, to 679 locations at the end of August 2012.⁴⁷

⁴⁶ "Biodiesel via pipelines in US first," *Pipelines International*, July 10, 2009, http://pipelinesinternational.com/news/biodiesel_via_pipelines_in_us_first/001583/#; and "Kinder Morgan Begins Biodiesel Shipments on Oregon Pipeline," *Gas Journal*, Sept. 2009, <http://www.pgionline.com/kinder-morgan-begins-biodiesel-shipments-oregon-pipeline>; and "Colonial Okays Biodiesel Pipeline Shipments in Georgia," *Heating Oil News*, Nov. 9, 2011, <http://www.heatingnews.org/heatingoilnews.php?IID=50>.

⁴⁷ DOE AFDC, "Alternative Fueling Station Total Counts by State and Fuel Type," http://www.afdc.energy.gov/afdc/fuels/stations_counts.html.

Biofuels Production Technologies and EIA Projections

Biofuels production technology continues to improve, both for mature processes, such as corn-based ethanol and vegetable oil-based biodiesel, and for new processes, such as renewable diesel, renewable jet fuel, and cellulosic biofuels.

Corn ethanol producers continue to reduce their usage of water and natural gas per gallon of output. The tendency of ethanol producers to sell more of their distillers grains wet rather than dried with natural gas is an important factor. In order to qualify as a low-carbon fuel in California, producers are virtually required to avoid drying their grains. Research and development work toward further co-product diversification is also beginning to pay dividends for corn-based ethanol producers. In particular, a significant portion of the industry has completed or is developing projects to extract corn oil from the distillers grains. This oil can be used to produce biodiesel or renewable diesel. If the extracted corn oil is of sufficient quality, it can also be used in food or animal feed products. Market development for these and potentially other value-added co-products remains an industry priority.

Biodiesel producers have diversified their slate of raw materials from primarily soybean oil to a mix including soybean oil, non-food-grade corn oil, and various types of waste greases. Research is also underway to produce vegetable oil from algae or cyanobacteria. Both are plant-like organisms grown in water, rather than on land, so they need not compete with existing crops.

Traditional biodiesel cannot be commingled with jet fuel in product pipelines in any measurable quantity, due to biodiesel's solvent properties⁴⁸ and potential problems with materials compatibility. Biofuels producers therefore looked to a different production technology that would use the same inputs normally used for biodiesel. Instead of the reaction of renewable oil with alcohol to produce biodiesel, the renewable oil can be reacted with hydrogen (hydrotreated) to produce a *drop-in* fuel compatible with existing infrastructure and equipment. This process can be used to produce renewable jet fuel or renewable diesel fuel that does not adversely affect jet fuel when the two products are shipped on the same petroleum product pipeline. In 2011, ASTM revised its specification for jet fuel to allow up to 50 percent hydrotreated renewable jet fuel.⁴⁹ Lufthansa and Continental Airlines subsequently operated regular flights on renewable jet blends in 2011.⁵⁰

Cellulosic Production

Progress on the commercialization of cellulosic biofuels has been slower than envisioned in 2007, when the RFS2 was enacted. The original RFS2 legislation called for 100 million gallons of cellulosic biofuel consumption in 2010. Table 3 summarizes the legislated RFS2 requirements for cellulosic biofuels, EIA's estimated production as of October prior to each calendar year, the amount EPA set in its final RFS2 rulemaking, and the volume of fuel sold domestically in 2010-12. EIA is required to estimate the future availability of cellulosic biofuels for EPA to use in its annual rulemaking for RFS2. Each October, EIA identifies the facilities that are either operational or likely to start operation in the subsequent year.

⁴⁸ The concern is that biodiesel will dissolve fuel system deposits, resulting in clogging and subsequent loss of engine power.

⁴⁹ OPIS, "Biofuels Update: Revised ASTM Aviation Standard Approves Renewable Fuel Blends," July 1, 2011.

⁵⁰ OPIS, "Biofuels Update: Lufthansa Ending Renewable Aviation Trial," Jan. 9, 2012; and "Biofuels Update: United Flies First Biofuel Flight; Negotiates to Buy 20M Gal/Yr of Biofuel," Nov. 7, 2011.

After researching the status of proposed and producing facilities, EIA builds its forecast from the nameplate capacity of cellulosic biofuels plants expected to come online before or during the target year and considers the months of operation and estimated utilization factors at those facilities.

Table 3. Cellulosic biofuels projected production and actual domestic sales, 2010-12

(million gallons ethanol equivalent)

Year	EISA RFS2 Target	EIA Projected Production ¹	EPA RFS2 Standard	Fuel Sold in United States
2010	100	6.44	6.5	0
2011	250	3.94	6.0	0
2012	500	6.9	10.45	-

Note: ¹As of October prior to each calendar year.

Sources: EISA2007 Public Law 110-140, <http://www.gpo.gov/fdsys/pkg/PLAW-110publ140/pdf/PLAW-110publ140.pdf>; EPA Fact Sheets for RFS2 Final Rule <http://www.epa.gov/otag/renewablefuels/420f10007.pdf>; RFS2 Final Rule 2011; <http://www.epa.gov/otag/fuels/renewablefuels/420f10056.pdf>; RFS2 Final Rule 2012; <http://www.epa.gov/otag/fuels/renewablefuels/documents/420f11044.pdf>; and Appendix D (EIA estimates required under Section 211(o)(3) of the Clean Air Act).

By 2010, only a few pilot plants had been built. For 2011, EIA estimated the nameplate capacity for three larger facilities and one of the pilot plants deemed likely to produce fuel at 11.75 million gallons, with expected output of 3.94 million gallons from these plants.⁵¹ Three of the four producers encountered financial or technical hurdles and reported no production in 2011. One producer, Blue Sugars, produced approximately 20,000 gallons for export.⁵² In October 2011, EIA projected 6.9 million gallons of cellulosic biofuels could be produced in 2012. EIA's current view is that actual production in 2012 will fall well below this level, with a best estimate of less than 0.5 million gallons by year-end 2012. Table 4 summarizes the projects EIA has studied over the years in order to prepare its projections.

Several companies began the procurement phase of their commercial projects in 2011. Procurement is a major step beyond breaking ground for a facility. To reach the procurement stage, a company must receive commitments from debt and equity investors for the full expected cost and begin completing major capital purchases. Two companies, KiOR and INEOS Bio, began this phase during 2011 and are expected to produce commercial quantities of cellulosic biofuels in late 2012 or early 2013. Additionally, several other companies received commitments for all or nearly all of their expected capital requirements, indicating they may have reached the procurement stage or will soon. Table 5 presents the nameplate capacity of commercial-scale plants that are under construction and are currently projected to produce commercial volumes before the end of 2013.

⁵¹ Letter from Richard Newell, EIA Administrator, to the Honorable Lisa Jackson, EPA Administrator, October 20, 2010. See Appendix D.

⁵² Robert Rapier, "Why Sugarcane Bagasse is the Most Promising Pathway for Cellulosic Ethanol." *Consumer Energy Report*, August 20, 2012, <http://www.consumerenergyreport.com/2012/08/20/why-sugarcane-bagasse-is-the-most-promising-pathway-for-cellulosic-ethanol/>. Blue Sugars was formerly KL Energy.

Table 4. Selected cellulosic biofuels projects studied by EIA, 2009-12

Company	Location	Product	Project Scale	Nameplate Capacity ¹ (million gallons)	Utilization ¹ (percent)	Production ¹ (million gallons)	Current Project Status	Year Online Initial/Revised
Blue Sugars (also known as KL Process Design)	Upton, WY	Ethanol	Pilot	0.75	10	0.08	Active	2007
BP Biofuels (formerly Verenum)	Jennings, LA	Ethanol	Pilot	1.40	0	0.00	Completed ²	2008
Terrabon ³	Bryan, TX	Bio-Crude	Pilot	0.93	0	0.00	Closed	2008
Zechem	Boardman, OR	Ethanol	Pilot	1.50	0	0.00	Completed ²	2010/12
Cello Energy ³	Bay Minette, AL	Diesel	Commercial	20.00	0	0.00	Closed	2010
Range Fuels ³	Soperton, GA	Methanol	Commercial	2.00	0	0.00	Abandoned ⁴	2010/11
Fiberight, LLC	Blairstown, IA	Ethanol	Commercial	3.80	0	0.00	Delayed ⁵	2010/11
Dupont Cellulosic Ethanol (formerly Dupont Danisco Cellulosic Ethanol)	Vonore, TN	Ethanol	Pilot	0.25	0	0.00	Completed ²	2010/11
INEOS Bio (also known as INP Bioenergy)	Vero Beach, FL	Ethanol	Commercial	8.00	< 3	< 0.24E	Delayed ⁶	2012/13
KIOR	Columbus, MS	Liquids	Commercial	11.0	< 3	< 0.33E	Delayed ⁶	2012/13

Notes:

¹ Capacity, utilization, and production estimates through December 2012² Although completed, plant has not generated RINs.³ Filed for bankruptcy.⁴ The site was purchased by Lanzatech but the Range Fuels Process was abandoned.⁵ Delayed due to financing challenges.⁶ Plants are expected to begin production within months.

E Estimate.

Source: U.S. Energy Information Administration, Office of Energy Analysis, October 17, 2012.

Table 5. Cellulosic biofuels projects currently projected to produce commercial volumes during 2012 or 2013

Company	Location	Nameplate Capacity (million gallons per year)	Year of Expected Start-up
KIOR	Columbus, MS	11	2012/13
INEOS Bio	Vero Beach, FL	8	2012/13
Abengoa Bioenergy	Hugoton, KS	23	2013
POET	Emmetsburg, IA	25	2013
Fiberight	Blairstown, IA	4	2013

Source: U.S. Energy Information Administration, Office of Energy Analysis, Sept. 18, 2012.

Appendix A. Legislation and Regulations

Several significant legislative and regulatory developments have affected biofuels over the past few years.

Renewable Fuel Standard and Related Legislation

The first Renewable Fuel Standard (RFS) was enacted as part of the Energy Policy Act of 2005 and required 7.5 billion gallons of renewable fuel to be blended into gasoline by 2012. The second and current Renewable Fuel Standard (RFS2) was enacted with the Energy Independence and Security Act of 2007 (EISA2007).⁵³ The EISA2007 statute created two principal categories – renewable fuels (subsequently referred to as “total”) and, as a subset, advanced biofuels. The “total” class includes virtually all renewable fuels produced by facilities that existed or were under construction in 2008 and any new sources of renewable fuel meeting a 20-percent reduction in greenhouse gas emissions relative to the fuels displaced (gasoline or diesel). Advanced biofuels, which include fuels such as sugarcane ethanol, require a 50-percent greenhouse gas emissions reduction.

EISA2007 explicitly prohibits ethanol derived from corn starch from being considered as an advanced biofuel. Within the advanced class there are also specific volume requirements for three subcategories of advanced biofuels: unspecified, cellulosic biofuels, and biomass-based diesel.⁵⁴ In addition to receiving credit for a specific category, these fuels also count toward the advanced biofuels and total renewable fuels volumes.

The statutory volumes for total renewable fuels requires U.S. consumption of all renewable fuels (advanced and nonadvanced) to increase from 9 billion gallons in 2008 to 36 billion ethanol-equivalent gallons in 2022.⁵⁵ In 2015 and thereafter, the maximum amount of corn-based ethanol that can be applied to the overall RFS is 15 billion gallons. The advanced biofuels requirement increases from 600 million gallons in 2009 to 21 billion ethanol-equivalent gallons in 2022. The statutory cellulosic biofuels requirement was set at 0.1 billion ethanol-equivalent gallons in 2010, rising to 16 billion gallons in 2022. Cellulosic biofuels production to date is far below the statutory targets set by EISA 2007. EPA issued waivers that substantially reduced the cellulosic biofuels obligation under RFS2 for the 2010, 2011, and 2012 program years. The biomass-based diesel requirement was set at 0.5 billion gallons in 2009, rising to 1 billion gallons in 2012, with the amounts required in the years after 2012 set annually by the EPA Administrator (see Table A-1).

⁵³ Public Law 109-58, <http://www.gpo.gov/fdsys/pkg/PLAW-109publ58/pdf/PLAW-109publ58.pdf>, Title XV, Subtitle A established a Renewable Fuel Standard (RFS) that mandated consumption of renewable fuels. Public Law 110-140, <http://www.gpo.gov/fdsys/pkg/PLAW-110publ140/pdf/PLAW-110publ140.pdf>. Title II, Subtitle A established a larger Renewable Fuel Standard (RFS2). Both laws amended the Clean Air Act.

⁵⁴ Cellulosic biofuels include cellulosic ethanol and drop-in fuels from cellulose. Biomass-based diesel includes biodiesel or renewable diesel from vegetable oils, animal fats, waste oils and greases, or algal oils. Unspecified advanced biofuels include ethanol from sugarcane, cellulosic ethanol above the quantity needed to meet the cellulosic biofuels requirement, and biodiesel and renewable diesel above the quantity needed to meet the biomass-based diesel requirement.

⁵⁵ Ethanol equivalence is the ratio of the energy content in a gallon of renewable fuel to the energy content in a gallon of denatured ethanol. One gallon of biodiesel, for example, is counted as 1.5 ethanol-equivalent gallons toward compliance with the advanced biofuels and total biofuels requirements. The biomass-based diesel requirement, however, is expressed in physical gallons, not ethanol-equivalent gallons.

Table A-1. RFS2 volume requirements, 2009-12 as implemented

(billion gallons ethanol equivalent, except where shown)

Year	Total ¹	Conventional Biofuels ²	Advanced Biofuels ¹	Advanced Biofuels			<i>Biomass-Based Diesel³</i> <i>(physical gallons)</i>
				Unspecified ²	Cellulosic Biofuel	Biomass-Based Diesel ³	
2009	11.1	10.5	0.6				
2010	12.95	12	0.95		0.0065	1.725	1.15
2011	13.95	12.6	1.35	0.144	0.006	1.2	0.8
2012	15.2	13.2	2	0.49	0.01045	1.5	1

Notes:

¹Requirements for total and advanced biofuels were established by Congress in EISA2007. These advanced biofuels requirements are not binding, and the combined requirements of 2009 and 2010 were exceeded by biomass-based diesel requirements after conversion into ethanol equivalent gallons. See page 14709 of RFS2 rulemaking, <http://www.gpo.gov/fdsys/pkg/FR-2010-03-26/pdf/2010-3851.pdf>.

²Conventional biofuels and unspecified advanced biofuels are calculated.

³Biomass-based diesel requirements in 2009 and 2010 were combined and after 2012 are not specified in the RFS2 legislation but must be at least 1 billion gallons. EPA issued its final rule on 2013 biomass-based diesel (setting a physical gallon volume) on Sept. 14, 2012. Multiply physical gallons by 1.5 to convert to ethanol equivalent gallons.

Sources: EPA, RFS2 Final Rule Fact Sheet, page 4, <http://www.epa.gov/otaq/renewablefuels/420f10007.pdf>; EPA, 2011 Standards For RFS2 Fact Sheet, page 2, <http://www.epa.gov/otaq/fuels/renewablefuels/420f10056.pdf>; EPA, 2012 Standards For RFS2 Fact Sheet, page 2, <http://www.epa.gov/otaq/fuels/renewablefuels/documents/420f11044.pdf>.

Given uncertainty about whether the new RFS volumes could be achieved, EISA2007 included a general waiver based on technical, economic, or environmental feasibility. In addition, the cellulosic biofuels mandate includes an option for waivers to be issued in years when the projected amount of cellulosic fuel sales is judged by the EPA Administrator to be below the compliance level. When waivers are issued, the EPA Administrator also has discretionary authority to reduce the advanced and total schedules. For all fuel requirements, if there is a 20-percent deficit in more than two consecutive years or a 50-percent deficit in any one year, regulatory adjustment mechanisms are provided to lower the mandated levels from that point forward. This rule, which may be implemented by the EPA Administrator no sooner than 2016, would modify all applicable volumes (including the overall and advanced biofuel totals) for all subsequent years.

California Low Carbon Fuel Standard (LCFS)

The California Air Resources Board (CARB), in contrast with EPA, does not assign biofuels to particular tiers. Under the LCFS, every fuel has its own demonstrated level of lifecycle greenhouse gas emissions. The level of greenhouse gas emissions is expressed as a value of carbon dioxide equivalent per unit of energy, in order to consistently account for greenhouse gases other than carbon dioxide. California uses the term *carbon intensity* for the level of greenhouse gas emissions per unit of energy produced from a particular fuel. The standard requires substitutes for fossil fuels that demonstrate lower lifecycle greenhouse gas emissions than the fuels they replace. Each gasoline or diesel substitute is assigned one or more pathways with unique levels of greenhouse gas emissions based on raw material production and biofuel production.

The California regulation currently includes 13 pathways for corn ethanol and 3 pathways each for sugarcane ethanol, biodiesel, and renewable diesel, while a number of other pathways have since been created for specific companies and production methods.⁵⁶ For corn ethanol, carbon intensity is lowered by using natural gas instead of coal, substituting biomass for natural gas or coal, and selling distillers grains wet instead of dry. For biodiesel and renewable diesel, carbon intensities can be lowered dramatically by using tallow or recycled cooking oils instead of soybeans.⁵⁷

Through much of 2011, industry and regulators were preparing to reduce the greenhouse gas emissions levels of gasoline and diesel fuel consumed in California by 0.5 percent from their respective baselines during 2012. In December 2011, the U.S. District Court for the Eastern Division of California ruled in favor of numerous trade groups that claimed the LCFS violated the Commerce Clause of the U.S. Constitution and granted an injunction blocking enforcement by CARB.⁵⁸ The lawsuit claimed that the LCFS attempted to regulate farming and ethanol production practices in other states, thus violating the Commerce Clause.

The future of the LCFS program remains uncertain. After the initial ruling, a request for a stay of the injunction was quickly filed by CARB, which would have allowed the LCFS to remain in place during the appeal process; however, that request was denied by the same judge who initially blocked enforcement of the LCFS. A new request for a stay of injunction while CARB appeals the original ruling was filed with the U.S. Ninth District Court of Appeals and was granted as of April 23, 2012, allowing CARB to continue enforcement of the LCFS until a ruling on the initial appeal is made sometime later in 2012.⁵⁹

Ethanol Blending

The most straightforward way to use ethanol is to blend it with gasoline. But gasoline demand growth has slowed considerably as a result of several factors including higher gasoline prices, slower economic growth, and greater vehicle efficiency.⁶⁰ The saturation of the United States' gasoline supply with ethanol sold as E10, termed the *blend wall*, motivated the ethanol industry to seek approval for a mid-level ethanol blend greater than 10 percent. Without a mid-level blend, incremental domestic ethanol supply would have no market outside of exports or domestic E85 sales. E85 is currently sold in very limited volumes because relatively few vehicles are capable of using the fuel and very few service stations dispense E85.⁶¹ In March 2009, Growth Energy and a number of ethanol producers petitioned EPA to approve the use of up to 15 percent ethanol by volume in finished gasoline (E15). In October

⁵⁶ Renewable diesel, like biodiesel, is produced from vegetable oil or animal fat but uses a hydrotreatment process to yield a product that is chemically similar to petroleum diesel. Biodiesel, on the other hand, is chemically different from petroleum diesel.

⁵⁷ CARB, LCFS Final Regulation Order, April 23, 2009, pages 11, 48-50, <http://www.arb.ca.gov/regact/2009/lcfs09/lcfscombofinal.pdf>.

⁵⁸ OPIS, "Biofuels Update: NPRA Lauds Court Ruling on California's LCFS Program", Dec. 29, 2011.

⁵⁹ State of California, "LCFS Enforcement Injunction is Lifted," April 24, 2012, http://www.arb.ca.gov/fuels/lcfs/LCFS_Stay_Granted.pdf.

⁶⁰ A description of issues that affected U.S. motor gasoline demand through 2011 can be found: <http://205.254.135.7/oog/info/twip/twiparch/120111/twipprint.html>.

⁶¹ Of the fleet of 223 million light-duty vehicles in the United States in 2012, 11 million are capable of using E85. (*Annual Energy Outlook 2012*, Table 40). Out of approximately 160,000 gas stations in the United States, 2,544 sell E85. (DOE Alternative Fuels Data Center and EIA Today in Energy, April 30, 2012).

2010, EPA approved the use of E15 in vehicles of model year 2007 and later after conducting vehicle tests in conjunction with the Department of Energy. In January 2011, EPA approved the use of E15 in light-duty vehicles beginning with model year 2001.⁶² As of January 2011, the vehicles covered by the two E15 waivers were estimated to be 60 percent of vehicles on U.S. roads. Automakers, however, continue to oppose the use of E15 in any vehicle that is not capable of using high ethanol blends up to E85. E10 will continue to be the limit for light vehicles built prior to model year 2001, all gasoline-powered heavy-duty vehicles, and all nonroad equipment. At the end of 2011, industry and regulators were working on health effects testing of E15 and pump certification, which are required to be addressed before E15 can be marketed.

The ethanol industry was also trying to persuade Congress to pass legislation to allow the same 1-pound Reid Vapor Pressure (RVP) waiver for E15 that is currently allowed for summer-grade conventional gasoline blended with 10 percent ethanol. This waiver would make the marketing of E15 less costly in the summer months, when gasoline volatility is required to be lower for air quality reasons. Approximately two-thirds of U.S. gasoline volume is subject to the existing 1-pound waiver.

In 2012 EPA began accepting submissions from retailers for approval to offer E15 blends. Numerous companies applied and were approved, with the first gallon of E15 gasoline being sold in July 2012 in Lawrence, Kansas. As of August 2012, E15 is still limited by the same liability, warranty, and distribution concerns that were present in 2011 despite the first official volumes of the fuel making their way into the market. While small volumes of the fuel are likely to continue being sold in select locations around the country, they are likely to remain marginal relative to the total ethanol supply until these issues are resolved.

Ethanol Tariffs and Tax Credits

The Volumetric Ethanol Excise Tax Credit (VEETC) expired at the end of 2011.⁶³ High petroleum prices, record ethanol production, the saturation of the gasoline pool with ethanol, a robust federal RFS2 mandate, and a need to reduce federal tax expenditures all contributed to the expiration of the credit.

Until the end of 2011, imports of fuel ethanol were subject to a tariff of \$0.54 per gallon. The tariff was intended to offset the ethanol blending tax credit, so that only domestic ethanol producers would benefit from the credit. The effect of the tariff was to prevent large-scale direct imports from Brazil. There were, however, two ways to import ethanol without tariff liability. One way was to ship ethanol from Brazil to the Caribbean for further processing. The ethanol could then be imported tariff-free under the Caribbean Basin Initiative.⁶⁴ Another way was to offset fuel ethanol imports with exports of U.S.-produced fuel ethanol and claim a *duty drawback*. This provision came into play in 2011, when

⁶² EPA, Office of Transportation and Air Quality, Fuels and Fuel Additives - E15, <http://www.epa.gov/otaq/regs/fuels/additive/e15/>.

⁶³ VEETC is the most recent iteration of a federal tax incentive for ethanol blending into gasoline that began in the 1970s, initially at \$0.60 per gallon of ethanol blended. The blending tax credit was reduced over time to \$0.45 per gallon of ethanol blended.

⁶⁴ A description of the Caribbean Basin Initiative can be found: <http://www.ustr.gov/trade-topics/trade-development/preference-programs/caribbean-basin-initiative-cbi>.

corn ethanol was essentially swapped for the sugarcane ethanol needed to meet the RFS2 and the California LCFS.⁶⁵

Biodiesel Tax Credit

There was also a credit for biodiesel blending into diesel fuel or heating oil in the amount of \$1.00 per gallon of biodiesel blended. This tax credit was allowed to expire at the end of 2009, contributing to a decline in biodiesel production in 2010. At the end of 2010, the biodiesel credit was reintroduced for 2011 and made retroactive for all of 2010. The RFS2 also played a role in the biodiesel industry's comeback in 2010 and 2011, because biodiesel is necessary to meet the biomass-based diesel requirement.

Biodiesel Blending

Biodiesel use is also required by various state and local mandates. Minnesota, the first state to require that all gasoline be blended with ethanol, also led the way with a 2-percent biodiesel (B2) requirement in all diesel fuel. More recent state legislative activity has focused on heating oil. Table A-2 presents the biodiesel content requirements and graduated triggers (gallons of in-state production or percent of in-state diesel demand) for states and localities mandating biodiesel. In addition to the states shown in Table A-2, New Mexico and Massachusetts have suspended B2 legislation and Louisiana has a B2 mandate passed in 2006 that has not been implemented.

Cellulosic Biofuels Producer Tax Incentives

Producers of cellulosic biofuels are eligible for a production tax credit of \$1.01 for each gallon. An incentive depreciation allowance is also available for cellulosic biofuel plant property. Both of these incentives expire at the end of 2012.⁶⁶

⁶⁵ OPIS, "Biofuels Update: Duty Drawback, RIN Credits Make Brazil-to-U.S. Ethanol Shipments Workable," June 28, 2011.

⁶⁶ Joint Committee on Taxation, List of Expiring Federal Tax Provisions 2011-22 (JCX-1-12), January 6, 2012.
<https://www.ict.gov/publications.html?func=startdown&id=4383>.

Table A-2. Summary of State and local biodiesel requirements

State or Locality	Regulated Product	Required Biodiesel Content (percent by volume)	In-State Production Requirement (million gallons)	Year Effective
Minnesota	Diesel fuel	2		2005
		5		2009
		10		2012
		20		2015 summer only
Portland, Oregon	Diesel fuel	5		2007
		10		-
Oregon	Diesel fuel	2	5	2009
		5	15	-
Pennsylvania	Diesel fuel	2	40	2009
		5	100	-
		10	200	-
		20	400	-
Washington	Diesel fuel	2	5	2009
		5	20	-
New York City	Heating Oil	2		2012
Vermont	Heating Oil	3		2012
		7		2016

Note: - indicates that in-state production requirement has not been reached.

Sources: Minnesota Department of Agriculture, "About the Minnesota Biodiesel Program,"

<http://www.mda.state.mn.us/renewable/biodiesel/aboutbiodiesel.aspx>; Bryan Sims, "Washington B2 mandate in effect; Oregon to soon follow," *Biodiesel Magazine*, 1/15/09, <http://www.biodieselmagazine.com/articles/3144/washington-b2-mandate-in-effect-oregon-soon-to-follow/>; Susanne Retka Schill, "Oregon B2 mandate takes effect Aug. 5," *Biodiesel Magazine*, 7/15/09, <http://www.biodieselmagazine.com/articles/3629/oregon-b2-mandate-takes-effect-aug.-5/>; Erin Voegelé, "Pennsylvania biodiesel mandate to take effect," *Biodiesel Magazine*, 1/15/09, <http://www.biodieselmagazine.com/articles/3178/pennsylvania-biodiesel-mandate-to-take-effect/>; Erin Voegelé, "New York City passes B2 oilheat mandate," *Biodiesel Magazine*, 7/13/10, <http://biodieselmagazine.com/articles/4320/new-york-city-passes-b2-oilheat-mandate/>; and "Vermont Requires Heating Oil With Biodiesel," *Carolina Virginia Farmer*, 5/31/11, <http://farmprogress.com/story-vermont-requires-heating-oil-with-biodiesel-0-49825>.

Appendix B. E85 Sales and Prices

E85 is a blend of 51 to 83 percent ethanol by volume and gasoline. EIA collects data for the production of conventional gasoline with more than 55 percent ethanol by volume, which is assumed to be sold as E85. In 2011, U.S. refiners and blenders produced 38.6 million gallons of E85, up from 25.6 million gallons in 2010.⁶⁷ In 2012 E85 production has remained largely on pace with 2011 levels, averaging over 3 million gallons of production per month through June. EIA's estimate of E85 production is slightly lower than the sum of the Iowa and Minnesota estimates of E85 sales for 2010.

Much of the knowledge about E85 dispensers was generated in Minnesota, because the state undertook an extensive pilot project to get E85 to retail pumps.⁶⁸ As of the end of August 2012, there were 2,544 stations in the United States selling E85.⁶⁹ Minnesota and Iowa collect and publish their own estimates of ethanol-blended fuel sales, which are summarized in Table B-1. Both states showed strong growth in sales of E85 from 2010 to 2011.

Table B-1. Iowa and Minnesota estimated sales of E85

(million gallons)

	Iowa	Minnesota	Two States
2010	9.3	16.6	25.9
2011	10.7	19.8	30.5
2012 Q1	2.3	3.6	5.9

Sources: Iowa Renewable Fuels Association, press releases, Dec. 6, 2011, Mar. 13, 2012, and June 20, 2012, <http://www.iowarfa.org/With3MonthsLeftIowaAlreadySetsE85All-TimeSalesRecord.php>; <http://www.iowarfa.org/E85SalesSetIowaRecordin2011.php>; and <http://www.iowarfa.org/IowaE85SalesReboundinFirstQuarter.php>.

Minnesota Department of Commerce, "2011 Minnesota E85 + Mid Blends Station Report," August 15, 2012, <http://mn.gov/commerce/energy/images/E-85-Fuel-Use-Data.pdf>.

U.S. average E85 prices increased during 2011, though not as much as wholesale ethanol. The average retail price of E85 climbed from \$2.75 per gallon in January 2011 to \$3.24 per gallon in July 2012, compared to average retail motor gasoline prices of \$3.08 per gallon in January 2011 and \$3.52 per gallon in July 2012.⁷⁰ This comparison demonstrates some of the consistent price discount of E85 relative to gasoline, due to its lower energy content. One gallon of E85 has approximately 76 percent of the energy content of a gallon of gasoline, which results in approximately a 24-percent reduction in miles per gallon when operating a particular vehicle on E85 instead of gasoline.

⁶⁷ EIA, "U.S. Refinery and Blender Production of Motor Gasoline, Finished, Conventional, Greater than E55," http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=M_EPM0CAG55_YPR_NUS_MBBL&f=M.

⁶⁸ DOE AFDC, "E85 Equipment and Processes" http://www.afdc.energy.gov/afdc/ethanol/equip_processes.html.

⁶⁹ DOE AFDC "Alternative Fueling Station Total Counts by State and Fuel Type," http://www.afdc.energy.gov/afdc/fuels/stations_counts.html.

⁷⁰ DOE AFDC, "Clean Cities Alternative Fuels Price Report," January 2011 and July 2012, http://www.afdc.energy.gov/afdc/price_report.html.

Appendix C. Assumptions, Calculations, and Data Series

Ethanol

Ethanol Assumptions

One bushel of corn yields 2.8 gallons of ethanol.

All ethanol feedstock is assumed to be corn with gross energy content of 0.392 million Btu per bushel.

Ethanol Calculations

Ethanol Share = $100 * \text{Ethanol Consumption} / (\text{Motor Gasoline Product Supplied} * \text{Days in Month})$.

Ethanol Margin (\$/gal) = Iowa Ethanol Price + 0.0031*Iowa Distiller Grains 10% Moisture Price
– Iowa Corn Price/2.8 – 0.026*Henry Hub Natural Gas Price – 0.35

Corn Inputs, June - August 2012: Calculated from ethanol production assuming a yield of 2.8 gallons per bushel of corn.

Ethanol Data Series

Ethanol Consumption/Production and Corn Inputs, January 2009 - June 2012: EIA, *Monthly Energy Review*, Table 10.3,

http://www.eia.gov/totalenergy/data/monthly/query/mer_data_excel.asp?table=T10.03

Motor Gasoline Product Supplied: January 2009 - June 2012, EIA, *Monthly Energy Review*, Table 3.5,

http://www.eia.gov/totalenergy/data/monthly/query/mer_data_excel.asp?table=T03.05.

Ethanol Consumption/Production, July - August 2012: EIA, *Short-Term Energy Outlook*, August 2012

<http://www.eia.gov/forecasts/steo/query/index.cfm?periodType=MONTHLY&startYear=2012&endYear=2012&formulas=1gx29xox104x1>.

Ethanol Gross Imports: January 2009 – June 2012, EIA, U.S. Imports of Fuel Ethanol by Destination,

http://www.eia.gov/dnav/pet/PET_MOVE_IMPCUS_A2_NUS_EPOOXE_IM0_MBBL_M.htm.

Ethanol Gross Exports: January 2009 – June 2012, EIA, U.S. Exports of Fuel Ethanol by Destination,

http://www.eia.gov/dnav/pet/pet_move_expc_a_EPOOXE_EEX_mbbldpd_m.htm.

Iowa Ethanol and Iowa Corn Prices: USDA Agricultural Marketing Service, National Weekly Ethanol Summary, <http://www.ams.usda.gov/mnreports/LSWEthanol.pdf>. Prices do not reflect blending tax credits or RIN values.

Ethanol Margin: National Weekly Ethanol Summary and Thomson-Reuters Henry Hub natural gas prices

<http://www.eia.gov/dnav/ng/hist/rngwhhdd.htm>.

U.S. Gulf Coast Gasoline: EIA, Weekly U.S. Gulf Coast Conventional Gasoline Regular Spot Price FOB,

http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EER_EPMRU_PF4_RGC_DPG&f=W.

Iowa Distiller Grains 10% Moisture Price: January 2009 – August 2012, USDA Agricultural Marketing Service, National Weekly Ethanol Summary, <http://www.ams.usda.gov/mnreports/LSWEthanol.pdf>.

Henry Hub natural gas prices Thomson-Reuters, <http://www.eia.gov/dnav/ng/hist/rngwhhdd.htm>.

U.S. Gulf Coast Gasoline spot price: January 2009 – August 2012, EIA, Weekly U.S. Gulf Coast Conventional Gasoline Regular Spot Price FOB, <http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EER EPMRU PF4 RGC DPG&f=W>.

Biodiesel

Biodiesel Assumptions

7.6 pounds of soybean oil yield 1 gallon of biodiesel.

From October 2011 through June 2012, approximately 60 percent of biodiesel feedstock was soybean oil. This fraction was assumed for July 2012 through September 2012.

Ethanol equivalence is the ratio of the energy content in a gallon of renewable fuel to the energy content in a gallon of denatured ethanol. An “actual” gallon of biodiesel, for example, contributes 1.5 ethanol-equivalent gallons to the RFS schedules.

Biodiesel Calculations

Biodiesel Share = $100 * \text{Biodiesel Consumption} / (\text{Distillate Fuel Oil Product Supplied} * \text{Days in Month})$

Iowa Soybean Oil (\$/gal biodiesel) = Iowa Soybean Oil * 7.6

Biodiesel Margin (\$/gal) = Iowa Biodiesel Price + 0.03 – 7.6 * Iowa Crude Soybean Oil Price/100 – 0.71 * Methanol Reference Price (\$/MT) / 2205 – 0.25

Biodiesel Data Series

Biodiesel Consumption/Production/Gross Imports/Gross Exports: January 2009 – May 2012, EIA, *Monthly Energy Review*, Table 10.4, http://www.eia.gov/totalenergy/data/monthly/query/mer_data_excel.asp?table=T10.04.

Distillate Fuel Oil Product Supplied: January 2009 – July 2012, EIA, *Monthly Energy Review*, Table 3.5, http://www.eia.gov/totalenergy/data/monthly/query/mer_data_excel.asp?table=T03.05.

Biodiesel Consumption/Production: July – September 2012, EIA, *Short-Term Energy Outlook*, August 2012, <http://www.eia.gov/forecasts/steo/query/index.cfm?periodType=MONTHLY&startYear=2012&endYear=2012&formulas=1gx29xox104x1>.

Fats & Oil Inputs: EIA, *Monthly Biodiesel Production Report*, June 2012, Tables 3 and 3a, <http://www.eia.gov/biofuels/biodiesel/production/>.

Iowa Biodiesel and Iowa Soybean Oil Prices: USDA Agricultural Marketing Service, National Weekly Ag Energy Roundup, <http://www.ams.usda.gov/mnreports/LSWAgEnergy.pdf>. Prices do not reflect blending tax credits or RIN values.

Methanol Reference Price: National Weekly Ag Energy Roundup and Methanex historical methanol prices, http://www.methanex.com/products/documents/MxAvgPrice_Feb282012.pdf.

U.S. Gulf Coast Diesel: EIA, Weekly U.S. Gulf Coast Ultra-Low Sulfur No 2 Diesel Spot Price, http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=EER_EPD2DXL0_PF4_RGC_DPG&f=W.

Appendix D. EIA Estimates Required Under Section 211(o)(3) of the Clean Air Act

- October 29, 2009, Letter from EIA Administrator Richard Newell to EPA Administrator Lisa Jackson
- October 20, 2010, Letter from EIA Administrator Richard Newell to EPA Administrator Lisa Jackson
- October 19, 2011, Letter from EIA Acting Administrator Howard Gruenspecht to EPA Administrator Lisa Jackson



Department of Energy
Washington, DC 20585

October 29, 2009

The Honorable Lisa Jackson
Administrator
Environmental Protection Agency
Ariel Rios Building
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Dear Ms. Jackson:

I am writing with regard to the statutory requirements set forth in the Energy Independence and Security Act of 2007 (Pub.L. 110-140). Section 202 of that Act amended Paragraph (3) of section 211(o) of the Clean Air Act that states “the Administrator of the Energy Information Administration shall provide to the Administrator of the Environmental Protection Agency an estimate, with respect to the following calendar year, of the volumes of transportation fuel, biomass-based diesel, and cellulosic biofuel projected to be sold or introduced into commerce in the United States.”

EIA publishes estimates of motor gasoline, jet fuel, biodiesel and ethanol in the monthly *Short-Term Energy Outlook (STEO)*. Because the data are located in several *STEO* tables, we combined the data into a single table (Table 1). While the table shows our current estimates for 2010 as of the October *STEO* release, estimates may change in future editions.

	2009	2010
Biodiesel consumption	0.03	0.05
Fuel ethanol consumption	0.70	0.79
Jet fuel product supplied	1.41	1.42
Motor gasoline product supplied	9.02	9.08
Source: <i>Short Term Energy Outlook</i> , October 2009		

EIA publishes estimates for transportation sector diesel fuel and cellulosic biofuel in the *Annual Energy Outlook (AEO)*, which we typically release in the spring of each calendar year. Given recent economic and industry events, our current unpublished projection for transportation sector diesel fuel and cellulosic biofuel has changed from those published in the *AEO2009*. The current estimate for transportation sector diesel fuel in 2010 is 3.19 million barrels per day which includes approximately 143 thousand barrels a day of marine use. The 2010 estimate for cellulosic biofuel supply has been revised downward from the 30 million gallons published in the *AEO2009* (released in April) to a current estimate of 5.04 million gallons (Table 2).



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This revised estimate for cellulosic biofuel is based on publicly available information (news reports, trade publications, and company websites), from which EIA compiled a list of cellulosic biofuels plants currently in production as well as those scheduled to come online in 2010 in Table 2 (including both nameplate capacity and projected utilization). For the small demonstration plants, we assume emphasis is on research and development of the technology and thus assign a 10-percent factor. We assume a 50-percent utilization for the Range Fuels commercial plant, which starts in 2010 but our expectation is that they will not produce at full capacity their first year and that only half of that output will yield a qualified fuel. Given these assumptions, Table 2 shows that a production level of 5.04 million gallons of cellulosic biofuels in 2010 is possible.

It is uncertain what, if any, contribution that existing pilot scale or foreign facilities would make, neither of which are included in Table 2. To date none of these entities has indicated an interest in generating Renewable Identification Numbers for the Renewable Fuels Standard program; therefore, they have been excluded from our estimates contained in the table below. However, combining these sources could add volumes approaching 100,000 gallons, resulting in total production level of 5.14 million gallons.

Table 2. Existing and projected cellulosic biofuel plant production capacities

Online	Company	Location	State	Product	Capacity (million gallons)	Expected Utilization (%)	Production (million gallons) ³
2007	KL Process Design	Upton	WY	Ethanol	1.5	10	0.15
2008	Verenium	Jennings	LA	Ethanol	1.4	10	0.14
2008	Terrabon	Bryan	TX	Bio-Crude	0.93	10	0.09
2010	Zechem	Boardman	OR	Ethanol	1.5	10	0.15
2010	Cello Energy	Bay Minette	AL	Diesel	20.0	10 ¹	2.00
2010	Range Fuels	Soperton	GA	Ethanol	5.0 ²	50	2.50
	Total				30.35		5.04

Notes: 1. Cello Energy, is assigned a 10-percent utilization factor as they have not been able to run on a continuous basis long enough to apply for a Synthetic Minor Operating Permit or produce significant amounts of fuel during 2009. 2. It is estimated that only half the 2010 projected capacity (10 million gallons per year) will be a qualified fuel. 3. The production from these facilities in 2009 is not surveyed by EIA or EPA.

If you have any questions regarding this information, please contact me or your staff may contact John Conti, Director of the Office of Integrated Analysis and Forecasting, at 202-586-2222 or John.Conti@eia.doe.gov.

Sincerely,



Richard G. Newell
Administrator
Energy Information Administration



Department of Energy

Washington, DC 20585

OCT 20 2010

The Honorable Lisa Jackson
 Administrator
 Environmental Protection Agency
 Washington, DC 20460

Dear Madam Jackson:

I am writing in regard to the requirement set forth in section 211(o)(3) of the Clean Air Act. The requirement is that I provide you in October of each year with an estimate of the volumes of transportation fuel, biomass-based diesel, and cellulosic biofuel projected to be sold or introduced into commerce in the United States in the following calendar year.

EIA publishes estimates of motor gasoline, jet fuel, and ethanol in the monthly *Short-Term Energy Outlook (STEO)*. Our current estimates, for 2011, which are located in several tables presented in the October STEO release, are summarized below (Table 1).

	2010	2011
Motor gasoline product supplied	9.02	9.09
Fuel ethanol consumption	0.845	0.878
Jet fuel product supplied	1.40	1.41

Source: *Short Term Energy Outlook*, October 2010

EIA publishes estimates for diesel fuel and cellulosic biofuel use in the *Annual Energy Outlook (AEO)*, which we typically release in the spring of each calendar year. Given recent economic and industry events, our projections for diesel fuel and cellulosic biofuels have changed from those published in the *AEO2010*. Our current estimate for transportation diesel fuel use in 2011 is 3.26 million barrels per day which includes approximately 147,000 barrels a day of fuel for marine use.

The current EIA estimate for cellulosic biofuel supply in 2011 is 3.94 million gallons (Table 2). This estimate, which is below the 5.3 million gallons published in the *AEO2010* released in May, is based on EIA analysis of publicly available information (news reports, trade publications, and company websites) including information regarding numerous cellulosic biofuel projects at various stages of development shared in discussions among our respective staff. In developing its estimate of supply in 2011, EIA staff focused on the small number of cellulosic biofuel plants currently in production, as well as those anticipated to reach mechanical completion in 2010. Given observed lags between mechanical completion and initial commercial production, EIA



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does not expect cellulosic biofuels plants that are not mechanically completed by the end of this year to produce commercial fuels in 2011.

Table 2. Cellulosic biofuel plants expected to generate cellulosic biofuel RINs in 2011

Year Online	Company	Location	State	Product	Nameplate Capacity (million gallons)	Expected Utilization (%)	Production (million gallons)
2007	KL Process Design	Upton	WY	Ethanol	1.5	10	0.15
2010	Fiberight, LLC	Blairstown	IA	Ethanol	6.0	46	2.76
2010	Range Fuels	Soperton	GA	Methanol	4	25	1.00
2010	Dupont Danisco	Vonore	TN	Ethanol	0.25	10	0.03
	Total				11.75		3.94

For small demonstration plants that seek to make some commercial sales, EIA assigned a 10 percent utilization rate due to an assumption that demonstration plant operators will emphasize research and development of the technology. For small demonstration plants that have communicated that they do not plan to make commercial sales in 2011, we have assumed they do not contribute to cellulosic biofuel supply and they are not included here.

Each large scale facility that is anticipated to meet mechanical completion by 2010 was considered individually. The Fiberight, LLC project has communicated its intention to run at a 46 percent utilization rate. For Range Fuels, we assumed a 25 percent utilization rate due to its repeated inability to meet stated production goals. The Cello Energy facility faces important financial, legal, and technological issues that have yet to be resolved and that cast significant doubt on its ability to sell or introduce any cellulosic biofuel into commerce in 2011. The current EIA estimate for cellulosic biofuel supply in 2011 therefore does not include any output from the Cello Energy facility.

Biomass-based diesel is the other motor fuel for which sales estimates for 2011 are to be provided pursuant to the requirement of Section 211(o) (3) of the Clean Air Act. Sufficient domestic capacity exists to achieve the 800 million gallon biodiesel mandate for 2011. EIA currently believes that at least 50 percent of the 2.0 billion gallons of capacity for which it collects biodiesel production data will be available to operate in 2011.

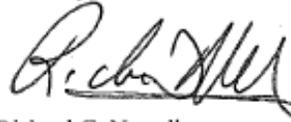
At the same time, biomass-based diesel production has recently been running far below production capacity, due to a combination of market factors, such as the cost of feedstock in relation to crude oil, and policy factors, such as the ending of tax credits for biodiesel production at the beginning of 2010. These low utilizations have been observed despite EPA's decision not to reduce the advance biofuel requirement when it reduced the cellulosic biofuel requirement in its 2010 rulemaking for the renewable fuel standard (RFS). It is also unclear how much biodiesel production would stay in the United States. Biodiesel RIN values have risen sharply in recent months, yet a review of trade statistics implies that U.S. biodiesel producers are apparently able to find more attractive markets overseas. For example, June 2010 data indicates that 8.3 million (30 percent) of the 28 million gallons of documented production was exported.

The production and sales of biomass-based diesel in 2011 will be sensitive to these factors. Given the importance of the two policy-related factors (the availability of blender's tax credits and RFS implementation decisions) in determining the sales volume of biomass-based diesel, we cannot provide a forecast of the sales volume for biomass-based diesel in 2011 that is independent of these policy outcomes.

The forecasts presented above reflect EIA's best judgment based on currently available information, but they are inherently uncertain. To illustrate these uncertainties, it is useful to consider how EIA's estimates for 2010, which were provided in my letter of October 29, 2009, have evolved. Relative to estimates in my year-ago letter (and nine months into 2010), current forecasts for 2010 reflect decreases of 60,000 barrels per day (0.7 percent) for motor gasoline product supplied, increases of 55,000 barrels per day (7.0 percent) for fuel ethanol consumption and increases of 20,000 barrels per day (1.4 percent) for jet fuel product supplied. While EIA does not have an updated numerical estimate for cellulosic biofuel sales during 2010, actual sales of fuel within this category, if any, are expected to fall far below the estimate of 5.04 million gallons provided last year.

If you have any questions regarding this information, please contact me or your staff may contact John Conti, Assistant Administrator for Energy Analysis, at 202-586-2222 or john.conti@eia.gov.

Sincerely,



Richard G. Newell
Administrator
U.S. Energy Information Administration

cc: The Honorable Gina McCarthy
Assistant Administrator for Air and Radiation
Environmental Protection Agency

Ms. Margo Oge
Director, Office of Transportation & Air Quality
Environmental Protection Agency



Department of Energy

Washington, DC 20585

OCT 19 2011

The Honorable Lisa P. Jackson
 Administrator
 Environmental Protection Agency
 Washington, DC 20460

Dear Madam Administrator:

I am writing in regard to section 211(o)(3) of the Clean Air Act, which requires the U.S. Energy Information Administration (EIA) to provide you each October with an estimate of the volumes of transportation fuel, biomass-based diesel (BBD), and cellulosic biofuel projected to be sold or introduced into commerce in the United States in the following calendar year.

EIA publishes estimates of motor gasoline, jet fuel, and ethanol use in the monthly *Short-Term Energy Outlook (STEO)*. Our current estimates for 2012, which appear in several tables included in the October *STEO* release, are summarized below (Table 1).

	2011	2012
Motor gasoline product supplied	8.81	8.85
Fuel ethanol consumption ²	0.84	0.87
Jet fuel product supplied	1.42	1.42

Source: *Short Term Energy Outlook*, October 2011
¹ Estimates are for total product supplied for all uses
² Fuel ethanol consumption volumes are contained in motor gasoline product supplied.

EIA publishes estimates of diesel fuel and cellulosic biofuel use in the *Annual Energy Outlook (AEO)*, which EIA typically releases in the spring of each calendar year. Given recent economic and industry events, our projections for diesel fuel and cellulosic biofuels have changed from those published in the *AEO2011*. Our current estimate for diesel fuel use in 2012 is 3.36 million barrels per day which includes approximately 26,000 barrels per day used by ocean-going vessels.

The current EIA estimate for cellulosic biofuel supply in 2012 is 6.9 million gallons, including roughly 6.7 million gallons sold by commercial scale plants (Table 2) and an additional 0.2 million gallons from smaller pilot plants. This estimate, which is well below the 22 million gallon figure published in the *AEO2011* released in April, is based on EIA analysis of publicly



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available information (news reports, trade publications, and company websites) including information regarding numerous cellulosic biofuel projects at various stages of development shared in discussions among our respective staff. In developing the estimate of supply for 2012, EIA staff focused on plants that are already in operation, as well as those anticipated to reach mechanical completion and begin production in 2012. Given observed lags between mechanical completion and initial commercial production, EIA does not expect plants that are not mechanically complete by mid-2012 to produce commercial fuels in 2012.

Table 2. Commercial-scale cellulosic biofuel plants expected to generate cellulosic biofuel RINs in 2012

Year Online	Company	Location	Product	Nameplate Capacity (million gallons)	Projected Utilization (%)	Projected Production (million gallons)
2011/12	Fiberight, LLC	Blairstown, IA	Ethanol	6.4	25%	1.6
2012	INP BioEnergy	Vero Beach, FL	Ethanol	8.0	25%	2.0
2012	KiOR	Columbus, MS	Liquids	12.2	25%	3.1
Total				26.6	25%	6.7

The commercial-scale facilities identified in Table 2 have been assigned a 25-percent utilization rate, which is typical of first-year operation of similar processes. This utilization rate is intended to reflect mechanical completion in the first or second quarter followed by a 6-month startup period during which limited production rates are achieved. For the pilot plants, EIA assigned a 10-percent utilization rate assuming that plant operators will continue to focus on research and development activities. During past years, small pilot or demonstration plants have not attempted to market their fuels or otherwise seek credit in the Renewable Fuel Standard (RFS) program. For this year's estimate, EIA used only those pilot-scale producers that communicated an intention to make commercial sales in 2012, including KL Process Design (Upton, WY), American Process (Alpena, MI), and ZeaChem (Boardman, OR).

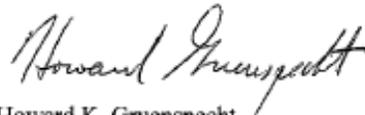
Turning to BBD, EIA believes that sufficient domestic production capacity exists to produce 1.0-billion-gallons in 2012 as called for in section 211(o)(2)(B)(i)(IV) of the Clean Air Act. Specifically, EIA's assessment is that at least 60 percent of the estimated 1.75 billion gallons of U.S. BBD capacity will be available to operate in 2012. While many BBD plants are currently operating at low utilization rates despite a significant Renewable Identification Number (RIN) price and a \$1-per-gallon blending credit, overall BBD production in 2011 is on track to exceed the 800-million-gallon 2011 BBD requirement. This may also meet part of the larger 2011 advanced biofuel requirement that will not be met by cellulosic biofuel or imports of Brazilian sugarcane ethanol. Since up to 200 million gallons of 2011 BBD production can be used for 2012 BBD compliance, producers may be trying to take advantage of the BBD blending credit, which is currently set to expire at the end of 2011, while it is certain to be available.

The production and sales of BBD in 2012 will likely be sensitive to decisions made regarding the continuation of the blending credit as well as to RFS implementation decisions. Given the importance of these two policy-related factors in determining BBD sales, EIA cannot provide a BBD sales forecast that is independent of these policy outcomes.

The forecasts presented above reflect EIA's best judgment based on currently available information, but they are inherently uncertain. To illustrate these uncertainties, it is useful to consider how the estimates for 2011 provided one year ago have evolved over time. Relative to estimates in Administrator Newell's October 2010 letter, current forecasts for 2011, nine months of which are already behind us, reflect decreases of 280,000 barrels per day (3.1 percent) for motor gasoline product supplied, decreases of 34,000 barrels per day (3.9 percent) for fuel ethanol consumption and increases of 10,000 barrels per day (0.7 percent) for jet fuel product supplied. While EIA does not have an updated numerical estimate for cellulosic biofuel sales during 2011, actual sales, if any, are expected to fall well below the estimate of 3.94 million gallons provided last year.

If you have any questions regarding this information, please contact me or your staff may contact John Conti, Assistant Administrator for Energy Analysis, at 202-586-2222 or John.Conti@eia.gov.

Sincerely,



Howard K. Gruenspecht
Acting Administrator
U.S. Energy Information Administration

cc: The Honorable Gina McCarthy
Assistant Administrator for Air and Radiation
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Ms. Margo Oge
Director, Office of Transportation and Air Quality
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