RFA RENEWABLE FUELS ASSOCIATION

FUELING A HIGH OCTANE FUTURE

2016 ETHANOL INDUSTRY OUTLOOK

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Amidst the seemingly endless drama attributable to the legislative or regulatory battle de jour and the ever increasing din of misleading advertising funded by the incumbent energy industry, one might be forgiven for losing sight of the fact that ethanol is still a business. So, while not ignoring the policy issues that will most certainly continue to shape the industry's trajectory in 2016 and beyond, this year's Outlook responds to a collective desire to return to the business of ethanol – one that has revitalized rural communities, created jobs in production, processing and marketing across the country, and provided consumer savings at the pump.

The politics of ethanol may be rooted in its renewable, home-grown, and clean burning characteristics. But the business of ethanol is rooted in octane. The world motor fuel market is short on octane, and ethanol is the lowest-cost source of octane available. Moreover, future growth in the industry is quite likely tied directly to automaker efforts to meet increasingly stringent fuel economy standards with higher compression ratio engines that will require even higher octane fuels.

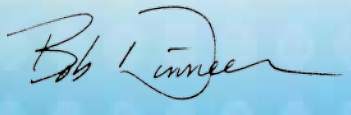
So understanding the octane benefits of ethanol, particularly when compared to potential competitors in the market, is critical to an appreciation for future challenges and opportunities facing the U.S. ethanol industry. These pages will provide an octane primer, along with a review of ethanol's place in the market today.

While 2015 was a far cry from 2014 in terms of profitability, last year was still another solid year of growth in the face of falling oil prices and policy instability. Indeed, in November, the industry hit the phenomenal production milestone of 1 million barrels per day! That's the equivalent of 15.3 billion gallons on an annualized basis. The industry also saw DuPont open the world's largest cellulosic ethanol production facility in Nevada, Iowa. Congratulations!

The industry's commercial success only added to the frustration when EPA, on November 30, finalized an RFS rule that adopted the oil companies' narrative about the blend wall and reduced the 2016 RFS obligation for undifferentiated biofuels (corn ethanol) to 14.5 billion gallons, 800 million gallons less than our demonstrated production capability. Of course, the number was not the main issue. What EPA's rule really did was to fatally undermine the ability of the RFS's credit trading mechanism (RINs) to incentivize investment in the new technologies or infrastructure that is necessary to fuel further market expansion. That is a drama that will most certainly continue to impact the legislative, regulatory, legal, and marketplace reality throughout 2016. Stay tuned.

In the meanwhile, enjoy this year's Outlook, the U.S. ethanol industry's most trusted and cited resource for the facts and trends driving the industry forward – this year in high octane fashion.

Sincerely,



Bob Dinneen, President & CEO

2015 ETHANOL PRODUCTION

ANOTHER YEAR, ANOTHER RECORD

After a banner year in 2014, the U.S. ethanol industry faced a host of familiar challenges in 2015. Low oil prices led to challenging production economics. Regulatory indecision caused uncertainty in the marketplace. And, ethanol opponents ramped up their campaign against the Renewable Fuel Standard (RFS).

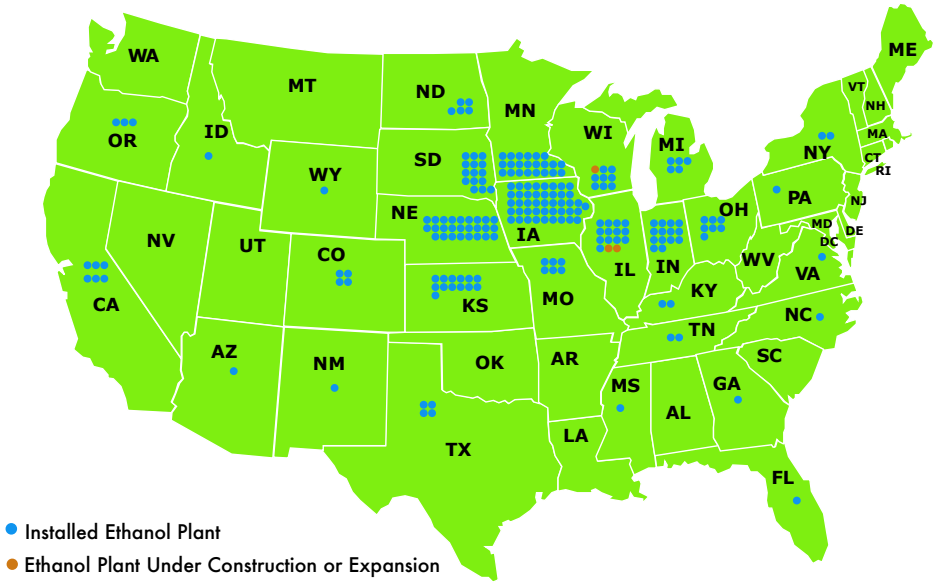
But the ethanol industry again showed its strength and resolve in 2015. Booming export demand and ethanol's indispensable value as a clean, low-cost octane booster helped producers weather the storm. In fact, ethanol bio-refineries in 29 states produced a record 14.7 billion gallons of high-octane renewable fuel and some 40 million metric tons of high-protein animal feed. Domestic ethanol blending also hit a new record, as lower oil prices led to an eight-year high in gasoline consumption. The third-largest corn crop in history also was a bright spot.

Meanwhile, the White House and Environmental Protection Agency (EPA) dealt a blow to ethanol producers, farmers, and consumers when they finalized RFS volume requirements for 2014-2016 that were below the levels mandated by Congress.

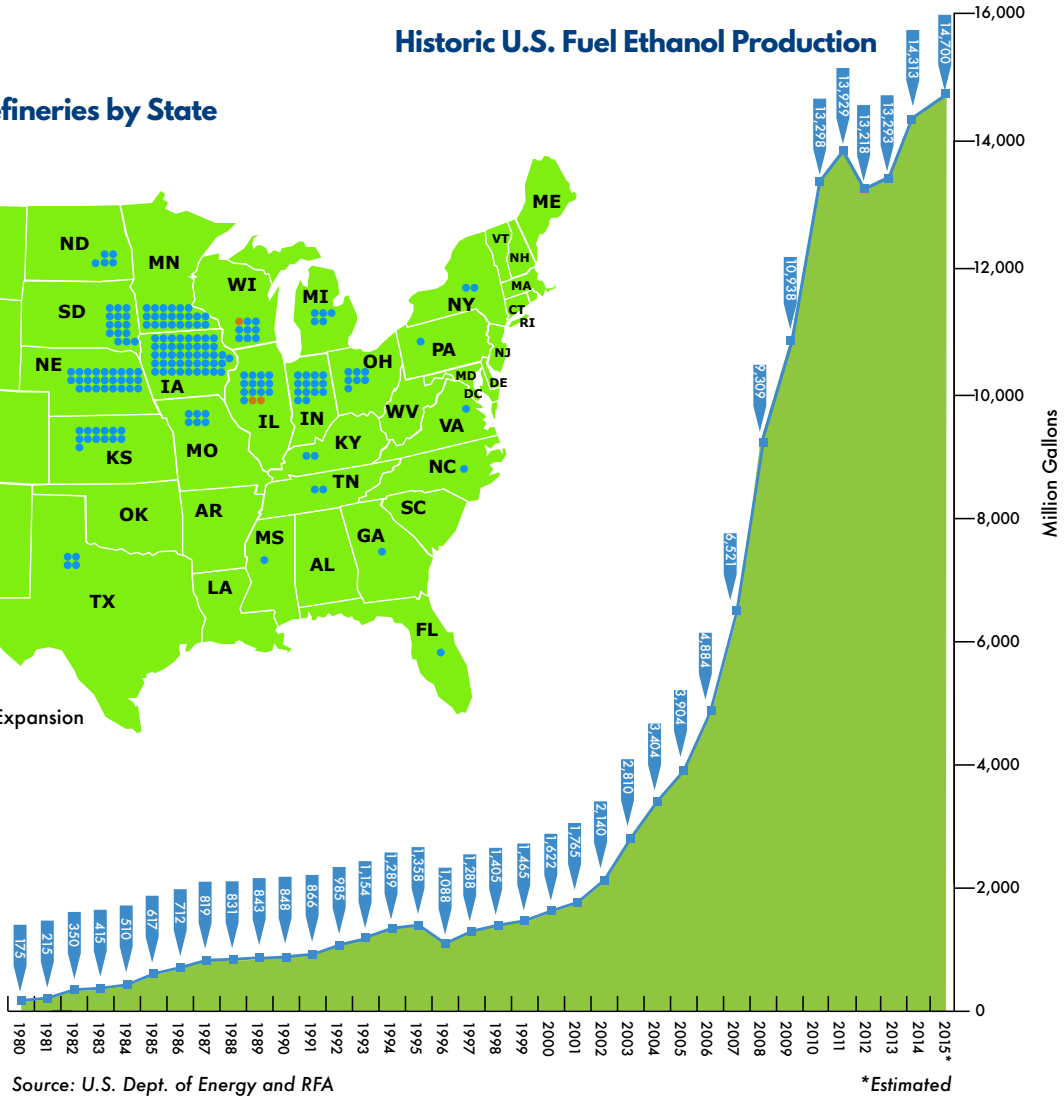
In the end, while OPEC's strategy to snuff out competition was successful in bringing the U.S. fracking boom to a halt, it certainly didn't deter America's ethanol producers from reaching new heights. And while the administration's mismanagement of the RFS continued to create uncertainty, it didn't stop the ethanol industry from innovating and adopting new technologies.

As 2016 began, America's ethanol producers remained ready for whatever challenges might arise in the new year, and poised to seize upon any new opportunities to expand production and use of homegrown renewable fuel.

U.S. Fuel Ethanol Biorefineries by State



Historic U.S. Fuel Ethanol Production



Source: U.S. Dept. of Energy and RFA

**Estimated*

U.S. Ethanol Production Capacity by State

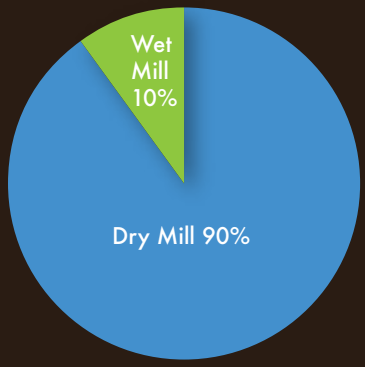
(Million Gallons/Year)

Production Facilities

	Production Capacity	Operating Production	Under Construction/ Expansion	Total	Installed Ethanol Biorefineries	Operating Ethanol Biorefineries	Biorefineries Under Constr./ Expansion
Iowa	3,947	3,921	-	3,947	44	42	0
Nebraska	2,119	2,066	-	2,119	26	24	0
Illinois	1,635	1,597	157	1,792	15	14	2
Minnesota	1,190	1,172	-	1,190	22	21	0
Indiana	1,163	1,163	-	1,163	14	14	0
South Dakota	1,032	1,032	-	1,032	15	15	0
Kansas	552	502	-	552	13	11	0
Wisconsin	537	537	5	542	9	9	1
Ohio	528	528	-	528	7	7	0
North Dakota	465	465	-	465	5	5	0
Texas	390	390	-	390	4	4	0
Michigan	273	273	-	273	5	5	0
Missouri	271	256	-	271	6	6	0
Tennessee	225	225	-	225	2	2	0
California	223	218	-	223	6	5	0
New York	169	169	-	169	2	2	0
Oregon	150	42	-	150	3	2	0
Colorado	127	127	-	127	4	4	0
Georgia	120	120	-	120	1	1	0
Pennsylvania	110	110	-	110	1	1	0
Idaho	60	60	-	60	1	1	0
North Carolina	60	-	-	60	1	0	0
Virginia	60	-	-	60	1	0	0
Mississippi	54	54	-	54	1	1	0
Arizona	50	50	-	50	1	1	0
Kentucky	36	36	-	36	2	2	0
New Mexico	30	-	-	30	1	0	0
Wyoming	10	-	-	10	1	0	0
Florida	8	-	-	8	1	0	0
TOTAL U.S.	15,594	15,113	162	15,756	214	199	3

Source: Renewable Fuels Association, as of January 2016

U.S. Ethanol Production by Technology Type



Source: U.S. Dept. of Agriculture

ETHANOL'S OCTANE ADVANTAGE

HOMEGROWN HORSEPOWER

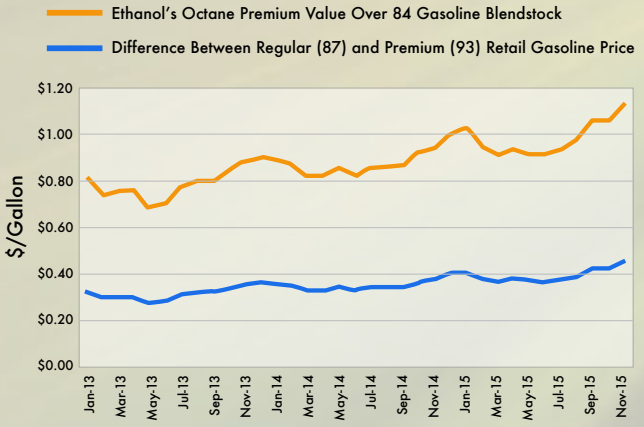
Most of the benefits associated with using ethanol–from reducing petroleum imports to decreasing greenhouse gas emissions–are well known. However, one of ethanol's most important benefits is also one of its best kept secrets: octane.

With an octane rating of 113, ethanol offers more engine knock resistance at a lower cost than any other gasoline additive on the planet. Not too long ago, gasoline refiners produced all of the octane they needed at the refinery from petroleum feedstocks. But refinery processes to increase octane production are energy intensive and costly. In response to the growing availability of ethanol over the past decade, most U.S. gasoline producers have reduced octane production at the refinery and optimized their operations to take advantage of ethanol's superior octane properties. Export markets are increasingly recognizing the appeal of using ethanol for its octane value as well.

Ethanol provides refiners with the lowest-cost solution for upgrading the octane content of gasoline to the minimum levels required for sale into commerce. Most refiners produce gasoline blendstock with an octane rating of 83 or 84, and upgrade it to 87 (the minimum allowable for "regular" grade gasoline in most states) by adding 10% ethanol.

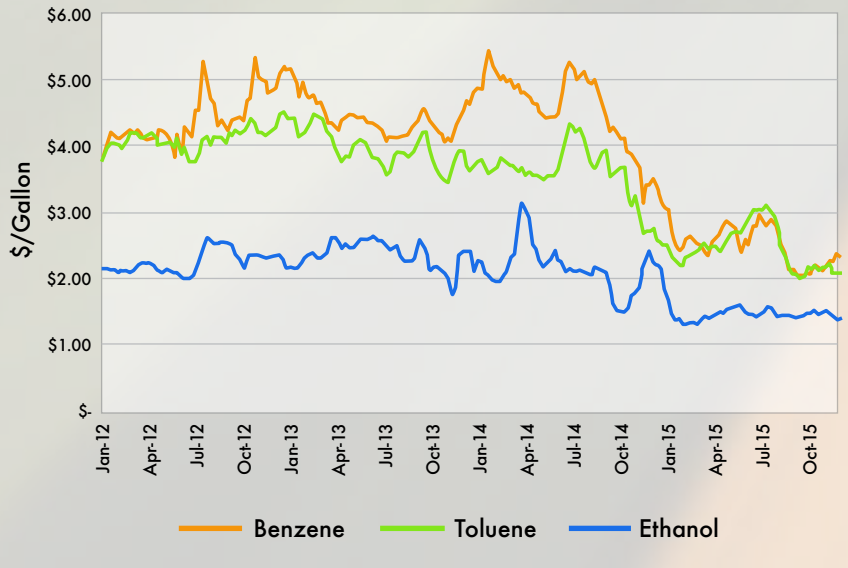
Not only is ethanol the lowest-cost octane source, it is also the cleanest and safest option available. Hydrocarbon octane sources such as MTBE and aromatics like benzene are highly toxic and pose great risk to our air and water.

Ethanol's Octane Premium Value Over Sub-Octane Gasoline Blendstock



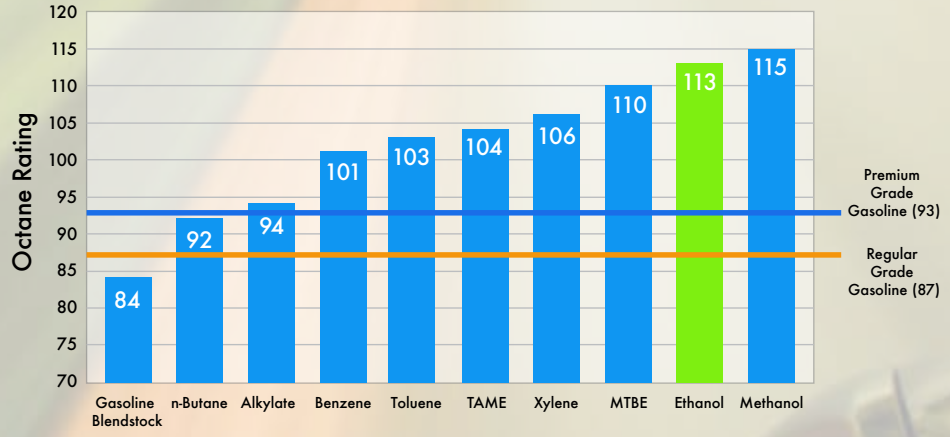
Source: U.S. Dept. of Energy and RFA

Weekly Spot Market Prices for Key Octane Sources



Source: Bloomberg and Thomson-Reuters

"Blending Octane" Ratings of Various Gasoline Components



Source: U.S. Dept. of Energy and Industry Sources

"Ethanol's value as an octane booster was underscored in 2015. Even with the drop in oil prices, we saw record demand for U.S. ethanol because it remained the most cost effective—and cleanest—source of octane in the world."

– *RFA Vice Chairman Mick Henderson, Commonwealth Agri-Energy, LLC*

What is octane and why is it important?

A fuel's OCTANE RATING is the measure of its ability to resist "knocking" or "pinging," which is caused by the air/fuel mixture detonating prematurely during combustion in the engine. According to the Department of Energy, "Using a lower octane fuel than required can cause the engine to run poorly and can damage the engine and emissions control system over time. It may also void your warranty."

HIGH OCTANE FUELS

POWERING THE FUTURE

Meeting aggressive new corporate average fuel economy (CAFE) requirements and tailpipe GHG emissions standards will require revolutionary changes in fuel and vehicle technologies. Accordingly, automakers are exploring a broad portfolio of technologies that can simultaneously improve vehicle efficiency and reduce emissions impacts. As stated by Sergio Marchionne, CEO of Fiat Chrysler Automobiles, "Everything is on the table."

As automakers have assessed various technology pathways toward complying with new CAFE/GHG standards, one very promising strategy has risen to the top: using high octane fuels in advanced internal combustion engines. When paired with downsized, high-compression, turbo-charged engines, high octane fuels can deliver the same—or better—fuel economy as regular gasoline, but with less energy and far fewer emissions. As EPA has recognized, high octane fuels "…could help manufacturers who wish to raise compressions ratios to improve vehicle efficiency as a step toward complying with the 2017 and later GHG and CAFE standards."

A growing body of research by automakers, government laboratories, and universities demonstrates that gasoline blends containing 20-40% ethanol can deliver the octane needed to maximize efficiency in advanced internal combustion engines. In addition to possessing an extremely high octane rating, ethanol is less expensive and cleaner than other potential octane sources.

In recent years, a broad coalition of stakeholders has rallied to help advance ethanol as the "key ingredient" in the high octane fuels of tomorrow. Ethanol producers, automakers, government researchers, fuel retailers, agricultural groups, and others continue to collaboratively chart the course to a high octane future that finally recognizes ethanol's full potential.

"Our analysis suggests that transitioning the fleet to higher-octane gasoline would result in significant economic and environmental benefits through reduced gasoline consumption."

– *Massachusetts Institute of Technology (Speth et al., 2014)*

A recent study by the Massachusetts Institute of Technology (MIT) found that use of high octane fuels in appropriately tuned vehicles by 2040 could:

- Reduce annual gasoline consumption in the U.S. by 3.0 - 4.4%;
- Provide additional CO2 emission reductions of 19–35 metric tons/year;
- Generate an annual direct economic benefit of $0.4–6.4 billion; and
- Offer a net societal benefit (including the social cost of carbon) of $1.7–8.8 billion annually.

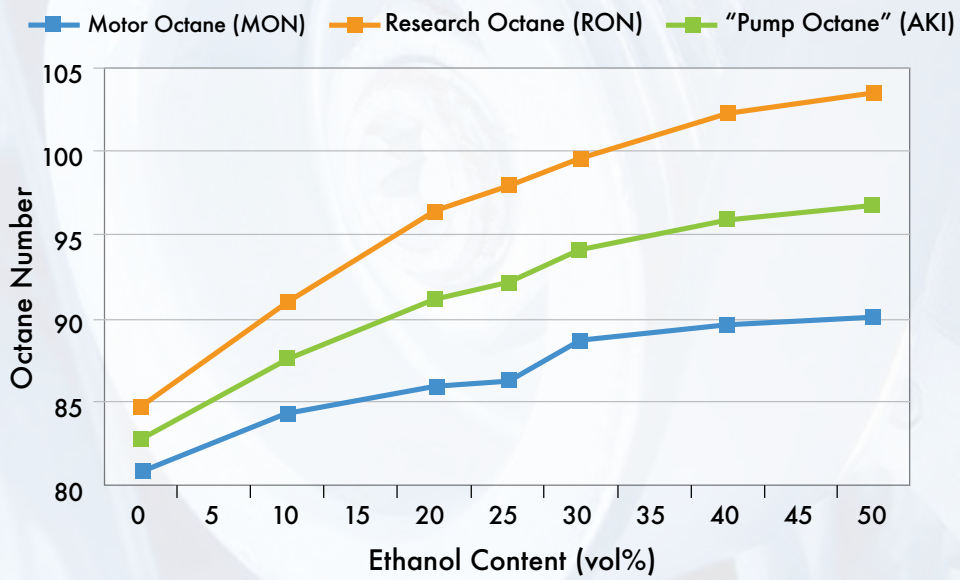
"Ethanol can be a major enabler in producing High Octane Fuel with significant vehicle efficiency gains and a large reduction in well-to-wheels greenhouse gas emissions."

– Argonne National Laboratory

"Higher ethanol content is one available option for increasing the octane ratings of gasoline and would provide additional engine efficiency benefits..."

– Ford, General Motors, Fiat Chrysler (Leone et al., 2015)

Octane Effect of Adding Ethanol to CA Gasoline Blendstock (CARBOB)



Source: RON, MON from Chupka et al. (2015); AKI based on R+M/2

ETHANOL EXPORTS AND IMPORTS

OCTANE DRIVES EXPORT GROWTH

The export market continued to serve as a crucial source of demand for U.S. ethanol in 2015, with approximately 850 million gallons shipped to more than 50 countries. In 2015, both total exports and net exports were on par with 2014 levels.

A number of new trading partners entered the fray in 2015, and China's rapid emergence as a Top 10 destination for U.S. ethanol was a major development. Canada remained as the U.S. ethanol industry's top export customer, receiving approximately 30% of all shipments. Brazil, the Philippines, South Korea, and India were other familiar top destinations.

While U.S. ethanol exports continued to surge, ethanol imports continued to sag. Fuel ethanol imports registered less than 100 million gallons for the second straight year, despite the demand pull from California's Low Carbon Fuel Standard and the RFS advanced biofuel standard.

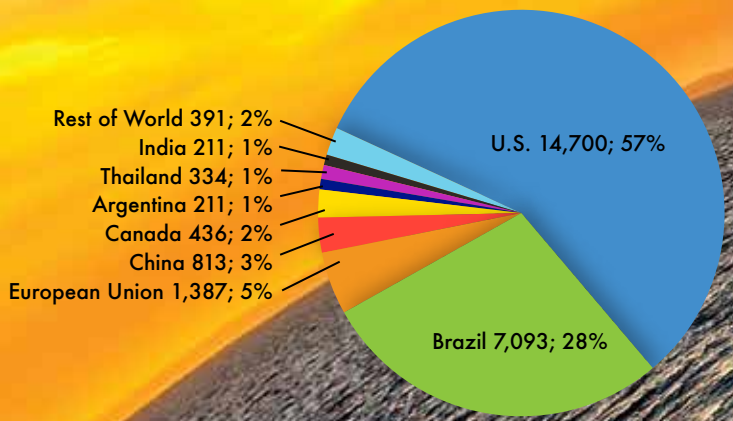
With much lower crude oil prices in 2015, many predicted that demand for U.S. ethanol exports would falter. However, robust export volumes in 2015 demonstrate that gasoline blenders in foreign markets are increasingly valuing ethanol for its unique octane and oxygenate properties. Just as U.S. refiners and blenders have optimized their operations to take advantage of ethanol as a low-cost octane source, so too are international gasoline producers.

"The main concern of the Chinese government and the Chinese people is pollution...China [has] started to import a significant amount of ethanol from the U.S. This could be the start of a trend of ever-increasing imports of U.S. ethanol."

– Chen Lin, Energy Expert and Investment Advisor

2015 Global Fuel Ethanol Production, By Country

(Country, million gallons; share of global production)



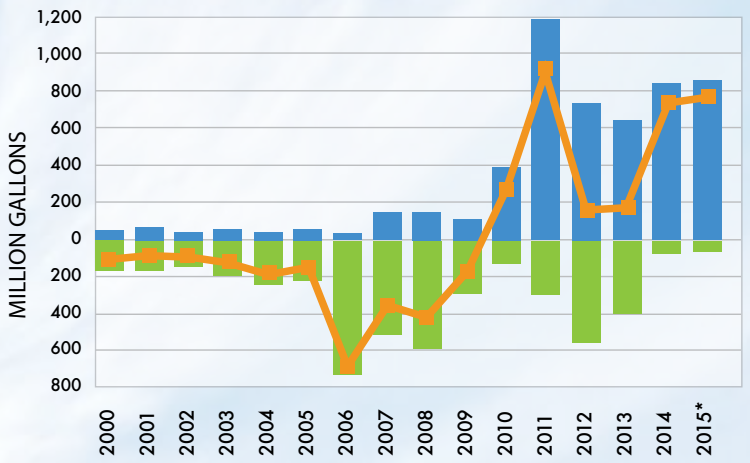
Source: RFA analysis of public & private estimates

The United States Continues to be the World's Low-Cost Ethanol Producer

	Brazilian Ethanol (FOB Sao Paulo)	U.S. Ethanol (FOB Chicago)	Difference
	U.S. Dollar/Gallon		
2010	$2.82	$1.83	$(0.99)
2011	$3.37	$2.56	$(0.81)
2012	$2.40	$2.24	$(0.16)
2013	$2.34	$2.23	$(0.11)
2014	$2.28	$2.04	$(0.24)
2015	$1.81	$1.52	$(0.29)

Source: U.S. Dept. of Agriculture, Oil Price Information Service

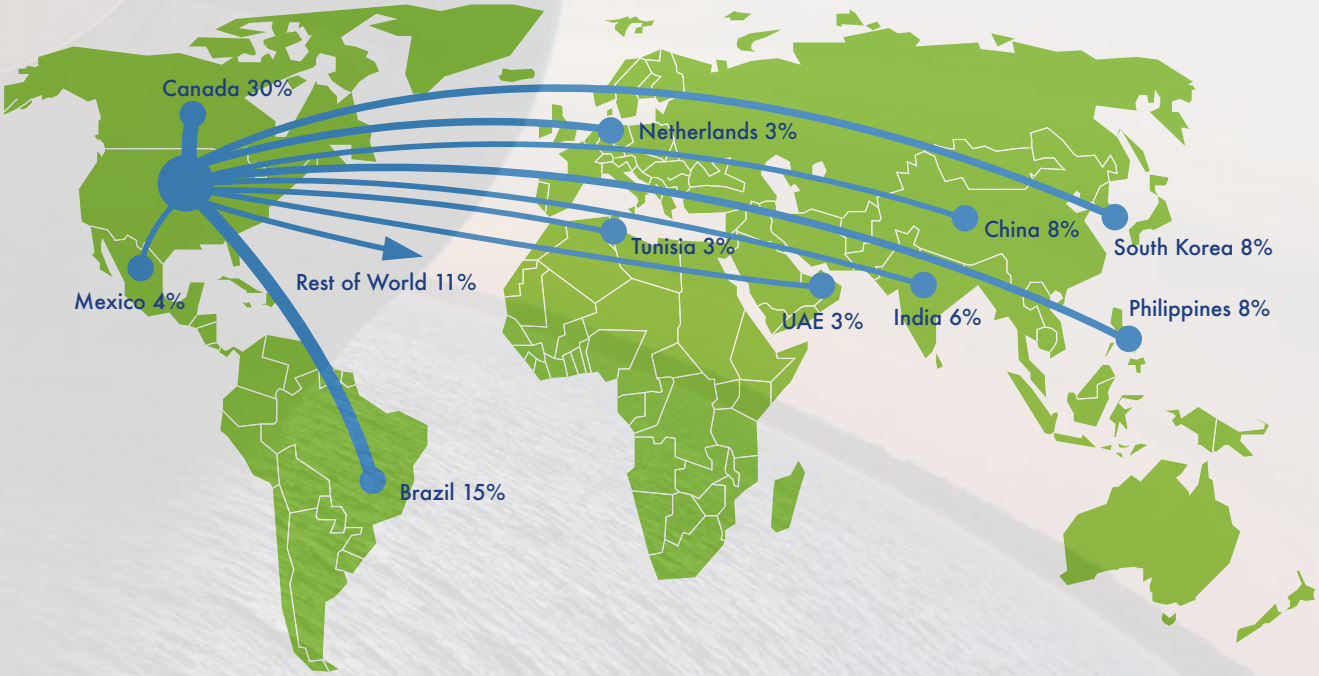
U.S. Ethanol Exports and Imports



** Estimated*

Sources: U.S. Dept. of Commerce, U.S. Census Bureau, Foreign Trade Statistics

Top Destinations for U.S. Ethanol Exports in 2015



Sources: U.S. Dept. of Commerce, U.S. Census Bureau, Foreign Trade Statistics
Based on Jan.-Nov. 2015

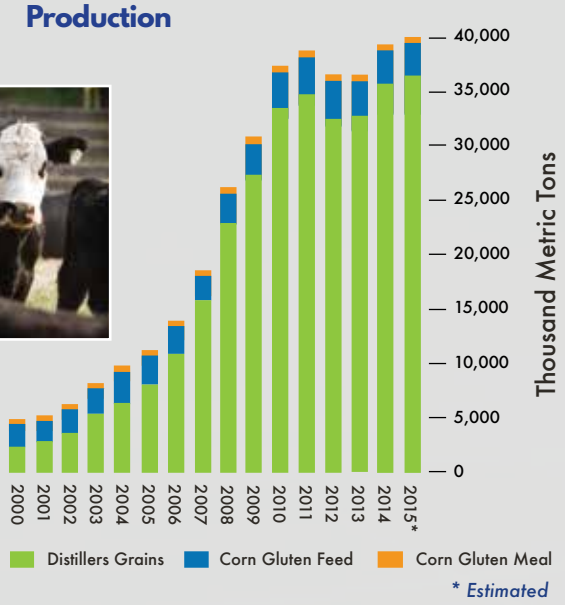
2015 CO-PRODUCT OUTPUT AND EXPORTS

FEED PRODUCTION SURGES

The U.S. ethanol industry makes an enormous contribution to the global animal feed supply. One-third of every bushel of grain that enters the ethanol process is enhanced and returned to the feed market, most often in the form of distillers grains (DDGS), corn gluten feed and corn gluten meal. Only the starch portion of the grain is made into ethanol; the remaining protein, fat, and fiber pass through the process. These nutrient-dense co-products are fed to beef cattle, dairy cows, swine, poultry, and fish in nations around the world.

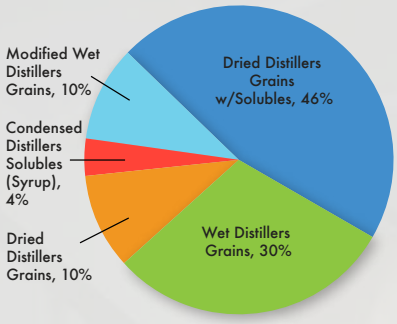
In 2015, the industry produced an estimated 40 million metric tons (mmt) of feed, making the renewable fuels sector one of the largest animal feed processing segments in the United States. Over the past decade, the ethanol industry has also emerged as a major producer of corn distillers oil (CDO), which is used as an animal feed ingredient or feedstock for biodiesel production. In 2015, approximately 85% of dry mills were extracting oil, and it is estimated that more than 2.7 billion pounds of CDO were produced.

U.S. Ethanol Industry Animal Feed Production



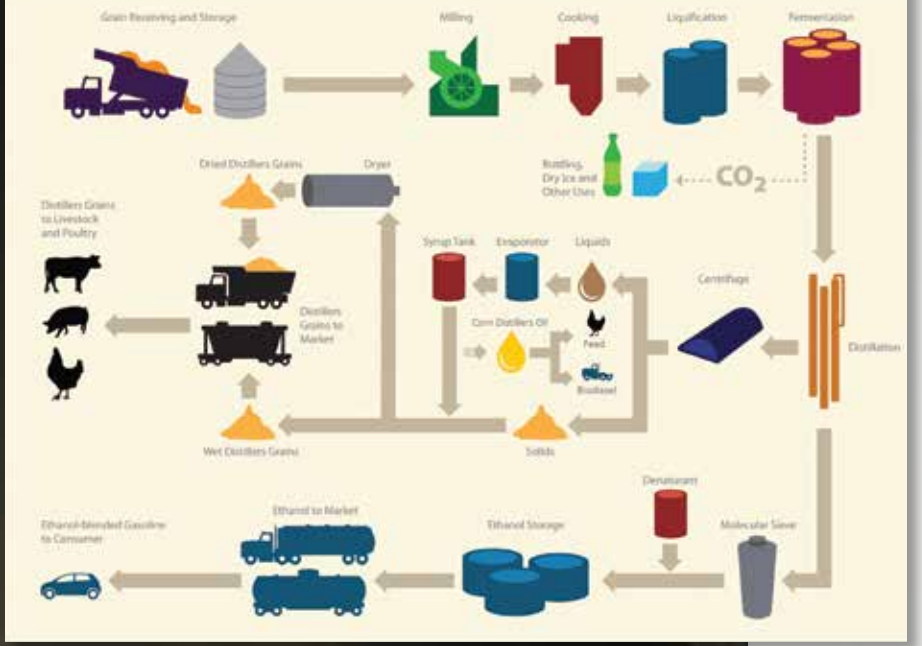
Source: RFA analysis of U.S. Dept. of Agriculture data
Note: All distillers grains converted to 10% moisture basis.

Distillers Grains Feed Production by Type

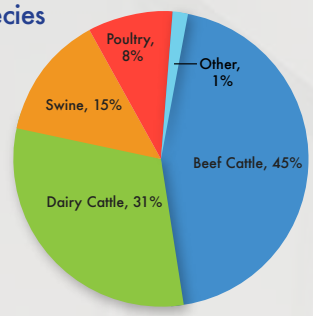


Source: U.S. Dept. of Agriculture

Dry Mill Ethanol Process



Distillers Grains Consumption by Species



Source: Distillers Grains Marketing Companies

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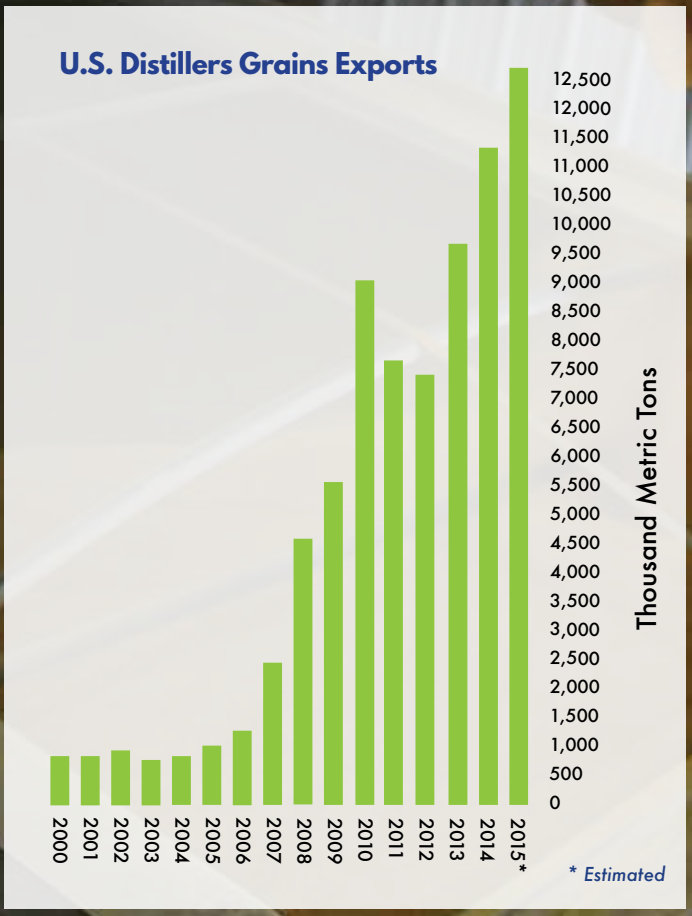
FEEDING THE WORLD

Ethanol producers exported roughly 12.6 mmt of distillers grains (DDGS) in 2015, a new record and 11% higher than 2014. Global demand has been climbing since 2012, expanding by a whopping 3 mmt over the past two years alone. In fact, exports accounted for roughly one-third of total DDGS demand in 2015.

China—the largest customer of U.S. distillers grains over the past five years—was the cornerstone of international market expansion in 2015, receiving over half of all U.S. shipments. Thus, it is imperative that free and open trade with China is maintained, and U.S. producers must fight any potential discriminatory trade barriers. Meanwhile, the rest of the world has also embraced the benefits of DDGS, with increasing volumes consumed outside U.S. borders. Mexico was the second-leading market for distillers grains exports, followed by Viet Nam, South Korea, Canada and Thailand.



Sources: U.S. Dept. of Commerce, U.S. Census Bureau, Foreign Trade Statistics

ECONOMIC IMPACT OF ETHANOL

STABILIZING RURAL ECONOMIES

While the 2015 crash in oil prices led to thousands of layoffs in the petroleum sector and economic challenges for many communities, growth in the ethanol sector continued to serve as a crucial wealth generator for rural areas across the nation. The ethanol industry is responsible for creating well paying, stable jobs in areas where such employment is often hard to come by.

In 2015, the production of 14.7 billion gallons of ethanol supported 85,967 direct jobs in renewable fuel production and agriculture, as well as 271,440 indirect and induced jobs across all sectors of the economy. Not surprisingly, five of the top 10 states with the lowest unemployment rates also rank in the top 10 ethanol-producing states.

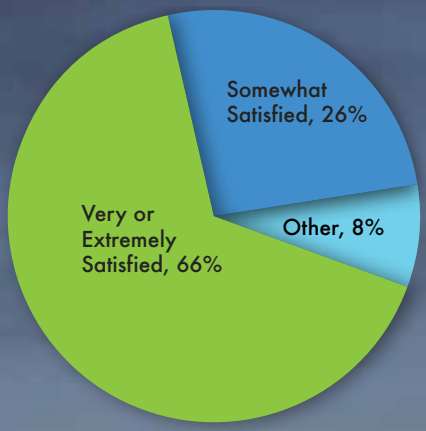
The industry added $44 billion to the nation's Gross Domestic Product (GDP) in 2015 and paid $10 billion in taxes. The sector's economic activity and job creation helped raise household income by $24 billion. Meanwhile, the U.S. ethanol industry spent $25 million on raw materials, other inputs, and other goods and services.

But more importantly, ethanol industry workers take great pride in what they do. A recent survey by Ethanol Producer Magazine found that more than 90% of ethanol employees are "satisfied" with their jobs, with 66% being "very" or "extremely satisfied." Amongst the reasons for their job satisfaction, "job security" ranked highest, with "competitive salaries" and "positive work environment" following closely behind.

Jobs in the ethanol industry are not solely limited to those found inside the gates of the biorefinery. America's renewable fuel industry supports jobs in the following sectors of the economy:

- Electric and water utilities
- Enzyme, yeast, chemical manufacturing
- Engineering and construction
- Machinery repair and maintenance
- Feed merchandising
- Transportation and handling
- Row crop farming
- Seed production
- Farm equipment manufacturing
- Livestock production
- Legal and accounting
- Government and regulatory
- Retail and wholesale fuel marketing
- Natural gas production

Ethanol Industry Job Satisfaction

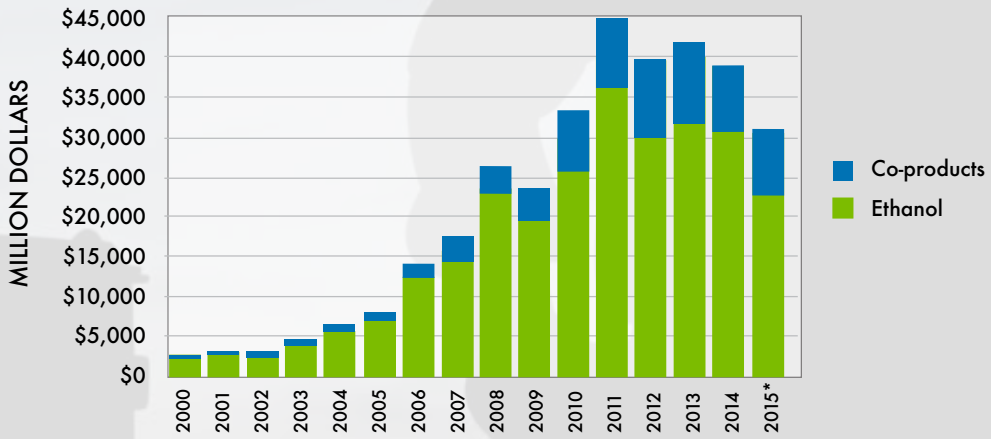


Source: Ethanol Producer Magazine

The ethanol industry "helps stabilize farm income and create job opportunity in rural places."

– U.S. Agriculture Secretary Tom Vilsack

Gross Value of U.S. Ethanol Industry Output



Source: RFA calculations based on U.S. Dept. of Agriculture data

In 2015, the production of 14.7 billion gallons of ethanol had substantial economic impacts, including:

- 85,967 direct jobs
- 271,440 indirect and induced jobs
- $44 billion contribution to GDP
- $24 billion in household income
- $10 billion in tax revenue

Source: J. Urbanchuk, ABF Economics LLP

ETHANOL AND ENERGY SECURITY

DIVERSITY REPLACES DEPENDENCE

The unexpected shutdown of a major oil refinery in Indiana in 2015 provided a clear-cut reminder of the dangers of over-reliance on one energy source. Though the Indiana refinery represents less than 2 percent of national refining capacity, the shutdown caused gas prices to spike by 30-40 cents per gallon throughout the Midwest. Increasing our use of domestic alternative fuels, like ethanol, can help blunt the impacts of such market shocks.

Growth in ethanol production and use has already helped to decrease reliance on crude oil imports. In 2005, the year the original RFS was adopted, America's net dependence on foreign petroleum peaked at just over 60%. When President George W. Bush signed into law the bill establishing the RFS, he declared that the new law would "lead to greater diversity of fuels for cars and trucks....every time we use home-grown fuel, we're going to be helping our farmers, and at the same time, be less dependent on foreign sources of energy."

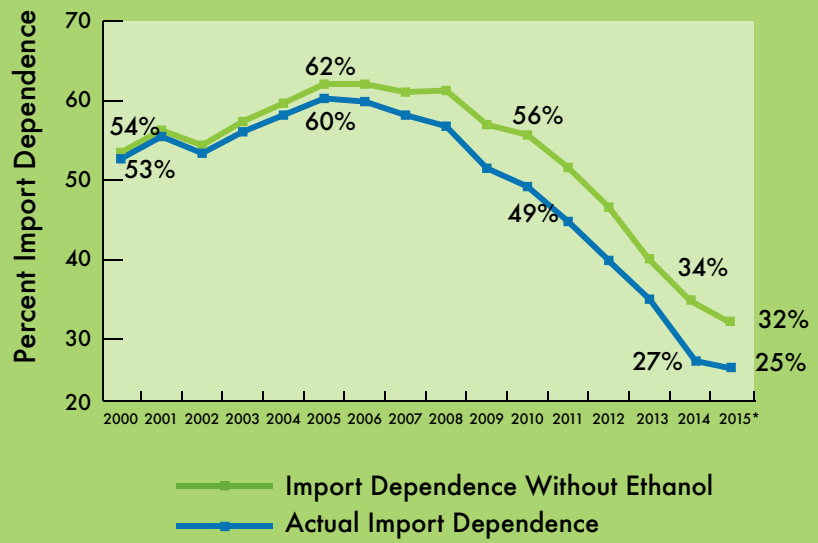
President Bush was right: the RFS has had a dramatic impact on our nation's energy security and diversity. Net petroleum import dependence fell to just 25% in 2015, but would have been 32% without the addition of 14.7 billion gallons of domestically produced ethanol to the fuel supply. The surge in ethanol production has reduced gasoline imports from nearly 10 billion gallons in 2005 to almost zero today. Looked at another way, the ethanol produced in 2015 displaced an amount of gasoline refined from 527 million barrels of crude oil. That's roughly equivalent to the volume of oil imported annually from Saudi Arabia and Kuwait combined.

The plunge in oil prices has given some the false impression that our fossil fuel supply is inexhaustible. However, nothing could be further from the truth. Petroleum remains a finite resource that will become harder to find and extract in the future. Our leaders need to embrace national energy policies and fuel sources that truly diversify and secure our energy supply.

"Biofuel production in the U.S. has increased rapidly over the last decade, enhancing energy security and reducing greenhouse gases from transportation. This growth has been driven in part by the Renewable Fuel Standard. Ethanol now displaces approximately 10 percent of U.S. gasoline demand by volume."

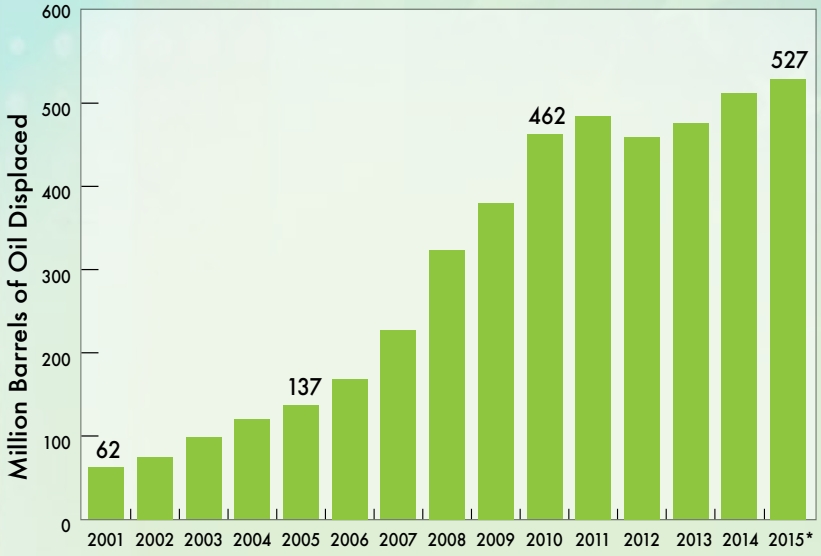
– U.S. Department of Energy

U.S. Petroleum Net Import Dependence (Crude Oil & Petroleum Products) With and Without Ethanol



Source: RFA based on U.S. Dept. of Energy data

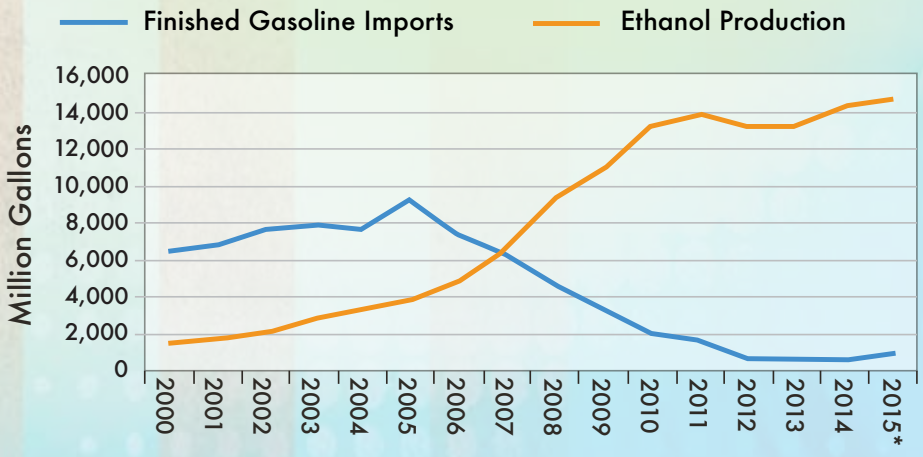
Historical Oil Import Displacement By Ethanol



* Estimated

Source: RFA based on U.S. Dept. of Energy data

U.S. Gasoline Imports vs. Ethanol Production



* Estimated

Source: RFA based on U.S. Dept. of Energy data

ETHANOL AND FOOD/FEED MARKETS

NOURISHING THE TRUTH

Even in the face of low corn prices, record feed supplies, and falling food prices, opponents of ethanol unbelievably clung to the contrived "food vs. fuel" myth in 2015. Lobbyists representing fast food restaurants, grocery manufacturers, and corporate poultry producers continued to suggest that the RFS is responsible for higher food prices. But their absurd claims fell on deaf ears...and for good reason.

Farmers harvested a corn crop of 13.6 billion bushels in 2015—the third-largest ever, trailing only 2014's record crop and 2013's robust haul. When grain stocks and ethanol co-products are properly considered, more grain is available for food and feed today than ever before. What's more, global grain supplies and ending stocks were projected to hit all-time highs in 2015/16, and just 2.95% of that record supply is expected to be used for U.S. ethanol production—a six-year low.

Meanwhile, food price inflation continued its downward trend, and consumers are spending a smaller portion of their income on food today than before. Between 1980 and 2004, food prices increased by an average of 3.5% per year; in contrast, food prices have risen by an average of just 2.7% per year since 2005, the year RFS was adopted. Further, the world food price index in 2015 fell to its lowest point since the global financial crisis of 2009.

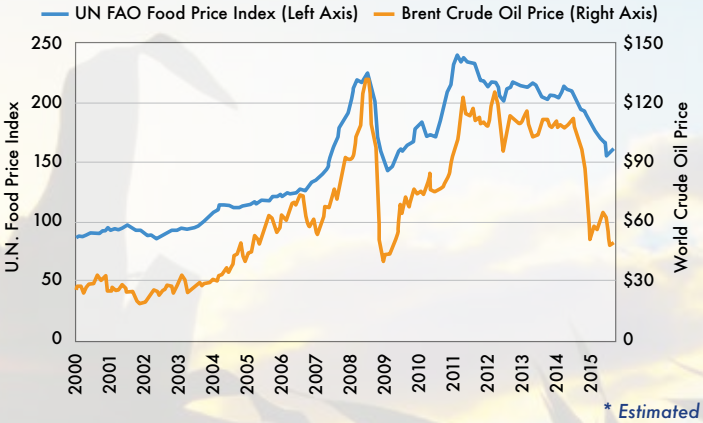
What Does $1 Spent on Food Really Pay For?

Source: U.S. Dept. of Agriculture

Just as ethanol demand isn't the only driver of corn prices, the cost of corn and other feed commodities isn't the only driver of retail food prices. In fact, only 17 cents of every dollar spent on food pays for the raw farm ingredients in the food item. The other 83 cents pay for processing, transportation, labor, packaging, advertising and other costs.

Prior to 2000, U.S. farmers produced just one corn crop larger than 10 billion bushels. Since 2000, they've done it 13 times.

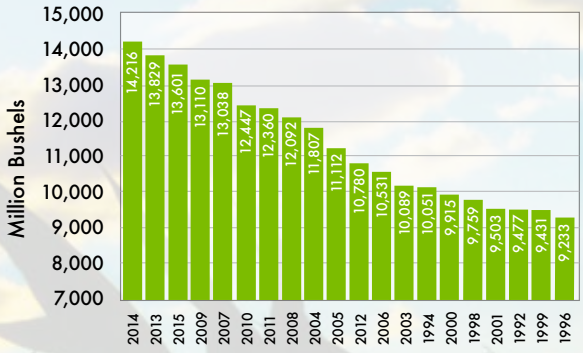
World Oil Prices Drive Global Food Prices



* Estimated

Source: United Nations Food & Agriculture Org. and U.S. Dept. of Energy

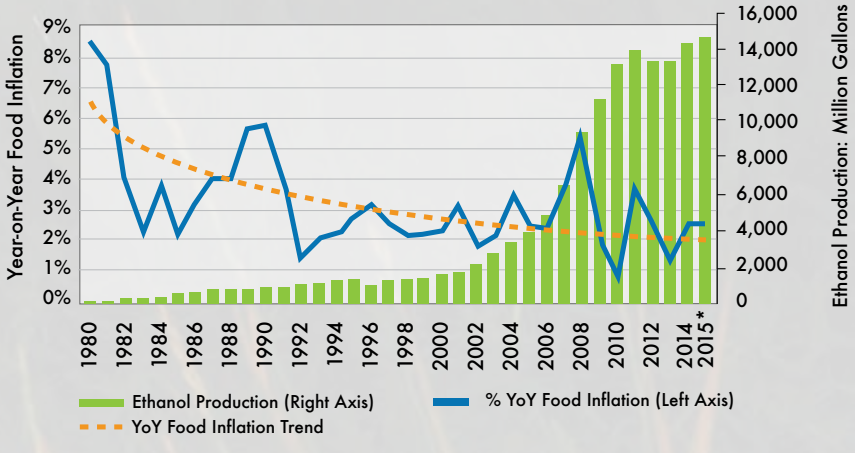
20 Largest Corn Crops in U.S. History



Source: U.S. Dept. of Agriculture

A recent World Bank report concluded that "most of the contribution to food prices changes from 1997-2004 to 2005-2012 comes from the price of oil."

U.S. Food Price Inflation and Ethanol Production

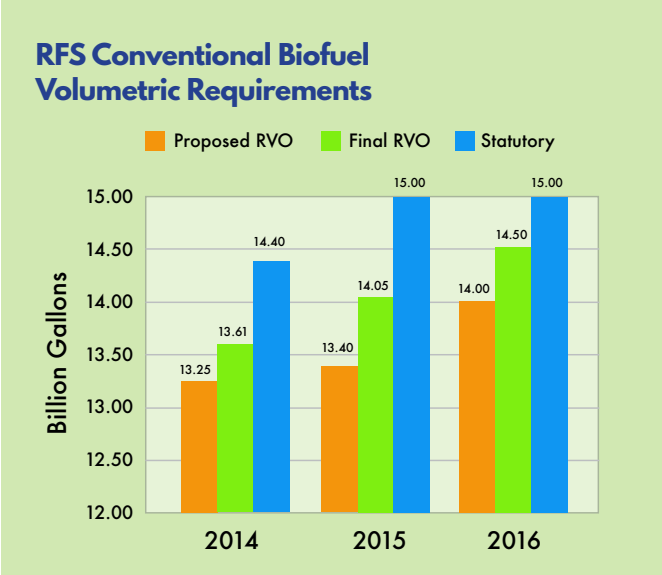


* Estimated

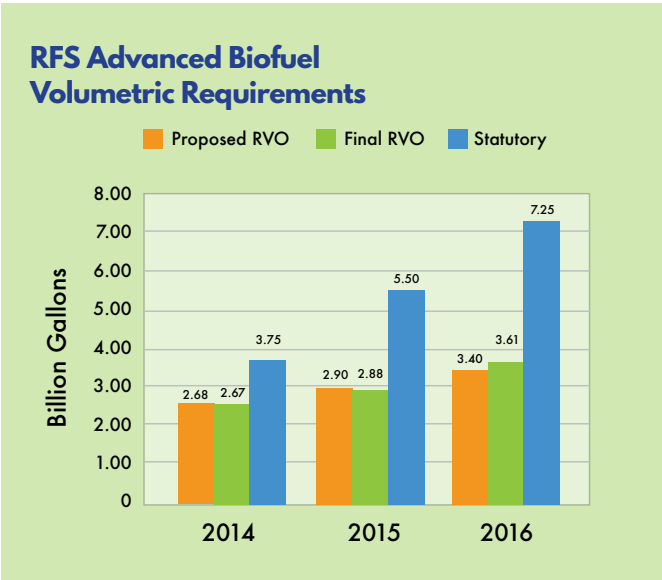
Source: U.S. Dept. of Labor and RFA

RENEWABLE FUEL STANDARD
10 YEARS OF SUCCESS

The Renewable Fuel Standard (RFS) celebrated its 10th anniversary in 2015, and the occasion provided an excellent opportunity to reflect on the program's many successes. Originally adopted in 2005, the RFS was greatly expanded two years later with the goals of reducing petroleum consumption, combating climate change, and stimulating the farm economy.



Source: U.S. Environmental Protection Agency



Source: U.S. Environmental Protection Agency

Without a doubt, tremendous progress has been made toward achieving the original objectives of the RFS. Biofuel production and consumption have grown dramatically. Dependence on petroleum imports is down significantly. Greenhouse gas emissions from transportation have fallen. The value of agricultural products rose to record levels. And, communities across the country have benefited from the job creation, tax revenue, and household income that stem from the construction and operation of a biorefinery.

Given the unmitigated success of the RFS over the past decade, EPA's decision in 2015 to backtrack on the program left ethanol producers, farmers, and consumers feeling disappointed and frustrated. In May 2015, EPA proposed 2014-2016 RFS volume requirements that were far below the levels specified by Congress. In response to feedback from RFA and other RFS supporters, EPA released a final rule in November 2015 that slightly raised the volumes.

However, EPA's final rule continued to rely on an unlawful methodology for setting the annual blending obligations. EPA suggested the cuts were necessary because the so-called "blend wall" prevents statutory volumes from being distributed. As the calendar flipped over to 2016, RFA and others continued to defend the statutory intent of the RFS and challenge the legality of EPA's final rule.

Where do 2016 Presidential Candidates Stand on the RFS?

2016 is an election year. That means energy, environmental, and agricultural policy issues will again make their way onto the national stage. Specifically, presidential candidates will be asked where they stand on the RFS and biofuels. RFA and its partners at America's Renewable Future have closely monitored the candidates' positions on these issues.

Renewable Fuel Standard Statutory Requirements

(Billion Gallons)

	Total RFS	Total Advanced Biofuel	Cellulosic Biofuel	Biomass-Based Diesel*	Other Advanced Biofuel	Conventional Renewable Fuel
2008	9.00	0.00	0.00	0.00	0.00	9.00
2009	11.10	0.60	0.00	0.50	0.10	10.50
2010	12.95	0.95	0.10	0.65	0.20	12.00
2011	13.95	1.35	0.25	0.80	0.30	12.60
2012	15.20	2.00	0.50	1.00	0.50	13.20
2013	16.55	2.75	1.00	1.00	0.75	13.80
2014	18.15	3.75	1.75	1.00	1.00	14.40
2015	20.50	5.50	3.00	1.00	1.50	15.00
2016	22.25	7.25	4.25	1.00	2.00	15.00
2017	24.00	9.00	5.50	1.00	2.50	15.00
2018	26.00	11.00	7.00	1.00	3.00	15.00
2019	28.00	13.00	8.50	1.00	3.50	15.00
2020	30.00	15.00	10.50	1.00	3.50	15.00
2021	33.00	18.00	13.50	1.00	3.50	15.00
2022	36.00	21.00	16.00	1.00	4.00	15.00

Source: Energy Independence and Security Act of 2007

**Biomass-based diesel volume must be 1 BG minimum beginning in 2012*

Here's a look at what some of them had to say:

Gov. Jeb Bush: "I think you also have to be sensitive that there is a lot of investment in ethanol plants, they've made projections...based on having the RFS in place. So what I've proposed is that it be phased out post-2022."

Dr. Ben Carson: "[A]s far as the Renewable Fuel Standard is concerned, there were certain promises that were made that extend out until 2022. And many people, you know, invested a lot of time, energy and resources based on those promises that were made. Those promises have to be kept."

Gov. Chris Christie: "I have unequivocally supported the RFS. I will implement the RFS as President of the United States and support it. We have invested a great deal as a country in making sure we develop renewable fuels. The RFS is a way to continue that investment and make America stronger by giving us more energy options, not fewer."

Sec. Hillary Clinton: "Strengthen the Renewable Fuel Standard so that it drives the development of advanced cellulosic and other advanced biofuels, protects consumers, improves access to E15, E85, and biodiesel blends, and provides investment certainty."

Sen. Ted Cruz: "I don't think that Washington should be picking winners and losers. When it comes to biofuel, when it comes to ethanol, ethanol is competitive in the marketplace and will remain competitive in the marketplace without a federal mandate from Washington."

Sen. Rand Paul: "The goal would be that so much ethanol is produced and sold that you wouldn't need the mandate anymore. That scares some people. But at the same time, then you'd have a real marketplace and you'd get to the point."

Sen. Marco Rubio: "It isn't fair to yank away something in the middle of it, after people have invested in it based on an existing government program. So what I have argued is since it is already in place until 2022, let it stay in place until 2022 to respect the investment that people have made."

Sen. Bernie Sanders: "We have got to do everything we can to break our dependence on fossil fuel, move to energy efficiency, and move to sustainable energies. So I think we have to be supportive of that effort and take every step that we can, in every way that we can, including growth of the biofuels industry."

Mr. Donald Trump: "The RFS is an important tool in the mission to achieve energy independence for the United States. The EPA should ensure that biofuel blend levels match the statutory levels set by Congress under the RFS."

E15 MARKET UPDATE

HIGHER OCTANE AT A LOWER PRICE

In spite of vexing regulatory hurdles and an aggressive misinformation campaign, the market for E15 continued to expand in 2015. After debuting at a single Kansas retail station in 2012, E15 has spread rapidly and is now sold at roughly 180 stations in more than 20 states.

And more stations are coming. In September 2015, the U.S. Department of Agriculture announced that some 1,500 retail stations in 21 states would receive $100 million to install nearly 4,900 pumps capable of dispensing E15, other mid-level ethanol blends, and E85.

Over the past three years, E15 has proven itself as a safe, economical, and popular alternative to gasoline. Contrary to Big Oil's claims, not a single verifiable case of "engine damage," inferior performance, or misfueling has been reported. In fact, it is estimated that nearly 200 million trouble-free miles have been driven on E15. Moreover, E15 typically offers slightly higher octane than E10, but usually costs a bit less.

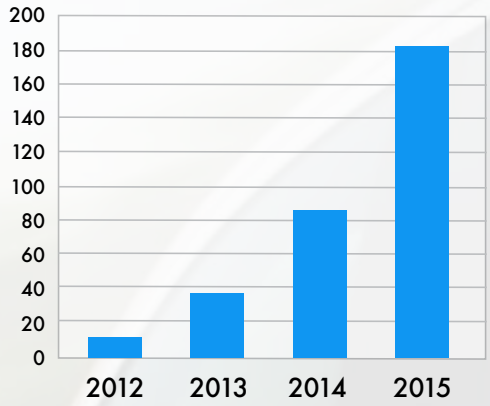
"The Biofuel Infrastructure Partnership is one approach USDA is using to aggressively pursue investments in American-grown renewable energy to create new markets for U.S. farmers and ranchers, help Americans save money on their energy bills, support America's clean energy economy, cut carbon pollution and reduce dependence on foreign oil and costly fossil fuels."

– U.S. Agriculture Secretary Tom Vilsack

While the Environmental Protection Agency's E15 waiver approves the use of E15 in all vehicles built since 2001 (about 90% of the current fleet), most automakers themselves are explicitly approving the use of the fuel in their newer vehicles. More than 70% of new (2016) models are clearly approved to use E15 by the manufacturer. Notably, Fiat Chrysler joined Ford, General Motors, Honda, Toyota, Volkswagen, and others in approving E15 for model year 2016 vehicles.

The largest remaining impediment to E15 growth is EPA's inequitable application of gasoline vapor pressure regulations. In effect, EPA's regulations make it nearly impossible for many retailers to sell E15 to conventional autos in the summertime. Resolution of this arcane barrier remains a top priority for RFA.

U.S. Retail Stations Offering E15



Source: RFA

Automaker Approval of E15

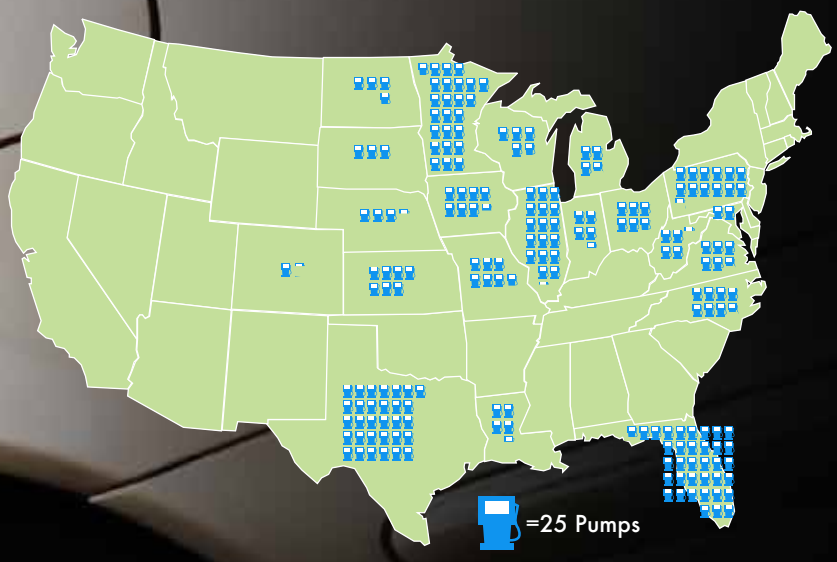
- E15 Explicitly Approved by Automaker in All Vehicle Models
- E15 Approved by EPA/Not Approved by Automaker
- E15 Explicitly Allowed by Automaker in Some Vehicle Models

	MY 2012	MY 2013	MY 2014	MY 2015	MY 2016
Audi					
BMW/MINI					
Fiat-Chrysler Automobiles (FCA Group)					
Chrysler					
Dodge*					
Fiat					
Jeep					
Ram					
Ford Motor Company					
Ford*					
Lincoln					
General Motors Company					
Chevrolet					
Buick					
Cadillac					
GMC					
Honda Motor Company					
Honda					
Acura					
Hyundai					
Jaguar					
Kia Motors					
Land Rover					
Mazda					
Mercedes-Benz					
Nissan Motor Company					
Nissan					
Infiniti					
Porsche					
Subaru					
Toyota Motor Corporation					
Toyota					
Lexus					
Scion					
Volkswagen					
Volvo					
All Others					

*Except Dodge Viper and Ford F-650/F-750

Source: RFA based on information from manufacturers

New E15/E85/Blender Pumps Resulting from USDA Biofuel Infrastructure Partnership Grants



Source: RFA based on U.S. Dept. of Agriculture data

E85 FLEX FUEL MARKET UPDATE

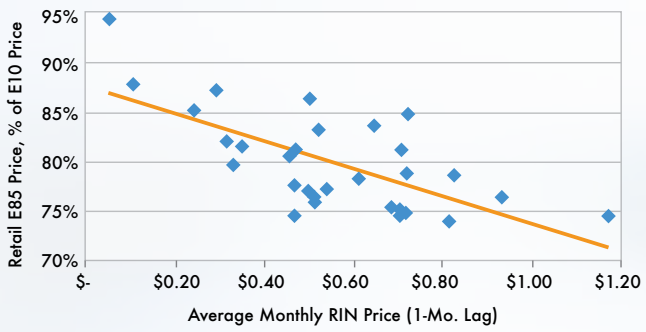
FLEXING FUEL CHOICE

The market for E85 and other flex fuels took two steps forward and one big step backward in 2015. First, the population of flex-fuel vehicles (FFVs) continued to grow, meaning more consumers have the ability to choose E85 and other flex fuels at the pump. Second, more retail gas stations began offering E85, with significant growth occurring in the densely populated southeast and west coast regions. These two important developments helped move E85 forward in 2015.

However, the Obama Administration dealt a major setback to the E85 market last year when EPA refused to enforce statutory Renewable Fuel Standard (RFS) requirements. Setting the RFS volumes at the levels specified by Congress would have allowed the program's RIN credit mechanism to drive increased investment in E85 and competitive retail pricing, finally breaking the so-called "blend wall." Ironically, even EPA recognizes that the RIN market is an important tool for "…providing an incentive for the continued growth of renewable fuels in the transportation fuel market without causing overall increases to the retail price of transportation fuel." Indeed, an analysis by Iowa State University found that the original 2016 RFS requirement of 15 billion gallons could be met if EPA would simply "…allow the market for RINs to work as intended, which will allow the price of E85 to fall to induce consumers to buy the fuel."

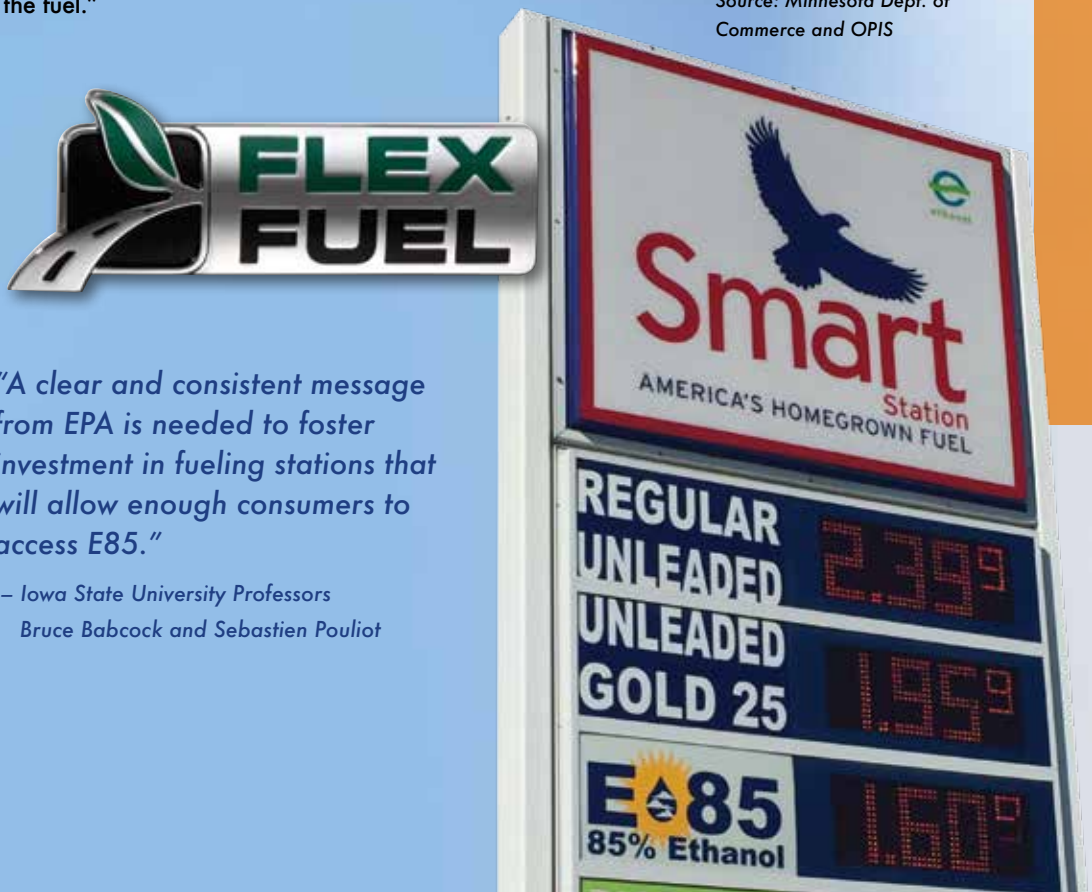
Still, innovative E85 blenders and retailers refused to let EPA control their destiny. More and more ethanol producers are blending E85 themselves or working directly with retail partners. This allows them to cut out the "middle man" and ensure consumers get the best deal possible. In addition, significant efforts–including a landmark U.S. Department of Agriculture grant program–are under way to further expand E85 retail infrastructure.

Minnesota E85 Prices (as a Percentage of E10 Prices) and RIN Values (Jan. 2013-July 2015)



Source: Minnesota Dept. of Commerce and OPIS

Data from the Minnesota Department of Commerce and OPIS clearly show that as RIN values increase, the price of E85 relative to the price of E10 decreases.



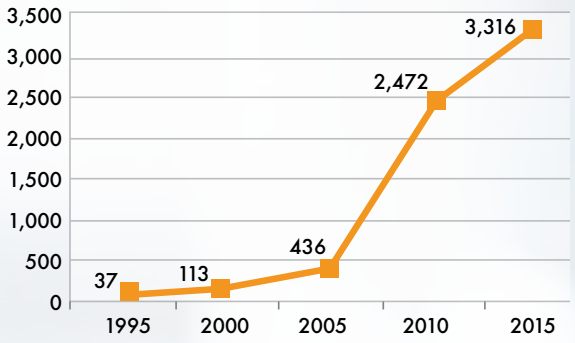
"A clear and consistent message from EPA is needed to foster investment in fueling stations that will allow enough consumers to access E85."

– Iowa State University Professors Bruce Babcock and Sebastien Pouliot

"EPA has provided obligated parties—who would rather be selling fossil fuels—a roadmap for how to prevent further growth of the renewable fuel industry."

– Steve Walk, Executive Vice President, Protec Fuels (Florida-based fuel marketer)

U.S. Retail Stations Offering E85 Flex Fuel



Source: Alternative Fuels Data Center and E85Prices.com

How Do RINs Work to Lower E85 Prices?

	($/gal.)
Blender buys 1 gallon of ethanol **(with a RIN attached)**	$1.50

	($/gal.)
Blender buys 1 gallon of natural gasoline	$1.00

	($/gal.)
Blender mixes 0.83 gallon of ethanol...	$1.25
...with 0.17 gallon of natural gasoline...	$0.17
...to produce 1 gallon of E85	$1.42

	($/gal.)
Blender detaches 0.83 RIN credit from ethanol and sells it to obligated party	$0.58

	($/gal.)
Gross cost to produce E85	$1.42
Blender passes on 80% of RIN value via E85 discount to stimulate increased sales	$(0.47)
Net cost of E85 after RIN discount	$0.95

**Example assumes RIN price is $0.70*

Source: RFA

NEW FUELS AND FEEDSTOCKS

ETHANOL'S EVOLUTION

Generation 1.5: Energy Through Synergy

For years, ethanol producers have suggested that the next generation of biofuels and bioproducts will not be produced exclusively by new, stand-alone, greenfield facilities. Rather, they believed that conventional ethanol plants would be amongst the first producers of advanced and cellulosic biofuels via the adoption of synergistic "bolt-on" technologies. This vision became reality in 2015, as numerous corn ethanol plants worked to install or start up new processes allowing onsite production of everything from cellulosic ethanol to zein protein to renewable diesel.

Examples of evolutionary "bolt-on" innovations include:

Adkins Energy, LLC, near Lena, Illinois, installed the capacity to produce **2 million gallons of biodiesel** per year using corn distillers oil extracted onsite.

Construction of a **zein protein** extraction plant is under way at **Big River Resources, LLC**, in Galva, Illinois. Zein is used as a feedstock for plastics and other industrial products.

Construction began in the fall of 2015 at **Central MN Renewables** in Little Falls, Minnesota, to install **Green Biologics Ltd.'s butanol** and **acetone** production technology.

The **CHS** dry mill at Annawan, Illinois, is adding a co-located **5-million-gallon-per-year biodiesel** facility that will use corn distillers oil as the feedstock.

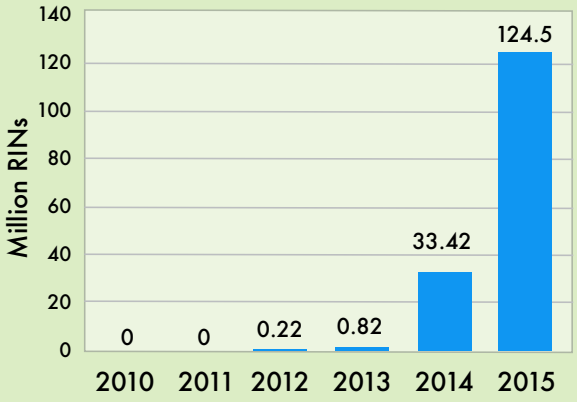
East Kansas Agri-Energy, LLC, in Garnett, Kansas, is building a co-located facility that will use corn distillers oil to generate **3 million gallons** of **renewable diesel** per year.

Pacific Ethanol, Inc. began production of **cellulosic ethanol** at its Stockton, California, plant in late 2015. The plant uses **Edeniq, Inc.'s Pathway Technology** to convert **corn kernel fiber** into nearly **1 million gallons** of cellulosic biofuel annually.

Quad County Corn Processors near Galva, Iowa, was the first conventional ethanol plant to produce **cellulosic ethanol** from **corn kernel fiber** in 2014. QCCP uses **Cellerate** technology to produce **2 million gallons** of cellulosic biofuel annually.

In late 2015, **Redfield Energy, LLC**, near Redfield, South Dakota, completed installation of **ICM's Fiber Separation Technology (FST)**, which allows the plant to improve efficiency and diversify coproduct streams. **E Energy Adams, LLC**, is also installing the ICM FST process at its plant in Adams, Nebraska.

Cellulosic Biofuel RIN Generation



Source: U.S. Environmental Protection Agency

The year 2015 marked a seminal moment for cellulosic ethanol, as commissioning or production began at the nation's three largest commercial-scale cellulosic ethanol facilities. Together, the three facilities have the ability to produce 75 million gallons of cellulosic ethanol per year when running at full capacity.

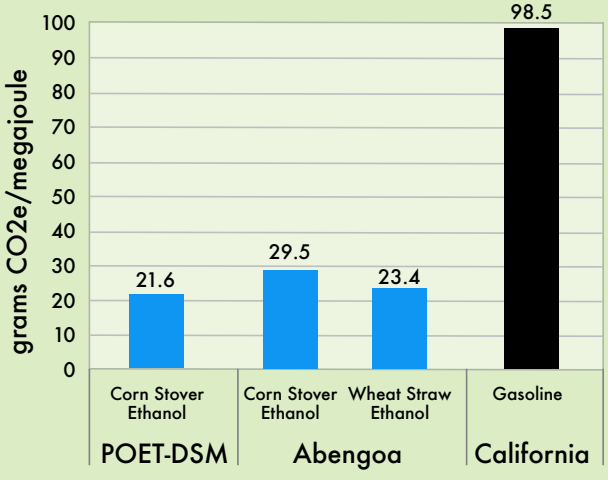
Abengoa's facility in Hugoton, Kansas, has the capacity to generate up to 25 million gallons of cellulosic ethanol annually from locally sourced agricultural residues. Meanwhile, the DuPont biorefinery in Nevada, Iowa, will also use agricultural residues like corn stalks to produce up to 30 million gallons per year. Finally, POET-DSM's Project Liberty in Emmetsburg, Iowa, has the capacity to produce 20 million gallons of cellulosic ethanol per year from corn residue. In addition, the idled INEOS Bio facility in Vero Beach, Florida, has the ability to produce 8 million gallons of cellulosic ethanol per year from wood and vegetative waste.

DuPont Cellulosic Ethanol (Nevada, IA)

Abengoa Bioenergy Biomass of Kansas (Hugoton, KS)

Although 2015 was a breakthrough year for the cellulosic biofuels sector, many challenges remain. Market instability and policy uncertainty have continued to hamper growth. EPA's mismanagement of the RFS cellulosic waiver credit program continued to undercut cellulosic RIN values and exacerbate inefficiencies in the fledgling cellulosic biofuel marketplace. The year ended with a bit of good news, however, as Congress provided a two-year extension of the Second Generation Biofuel Producer Tax Credit and other tax credits. Still, the industry needs long-term policy solutions; and RFA will continue advocating for measures that provide enduring certainty and market access.

Analysis by the California Air Resources Board Finds that Cellulosic Ethanol Reduces GHG Emissions by 70-80% versus Gasoline



Source: California Air Resources Board

ETHANOL AND SUSTAINABILITY

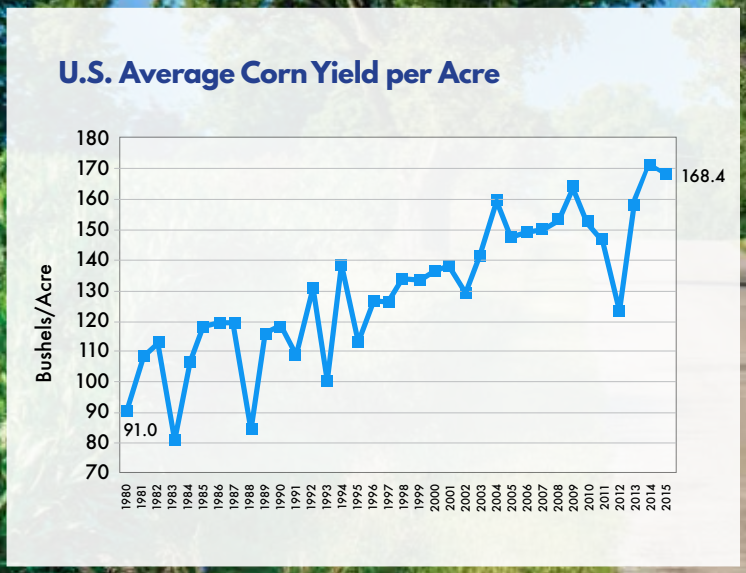
DOING MORE WITH LESS

While some have argued that grain ethanol is a "mature technology" with little room for improvement, America's ethanol producers have proven otherwise. Engineering and design enhancements, new process technologies, automation upgrades, and other advances have led to remarkable gains in efficiency.

In turn, those efficiency improvements have reduced the energy intensity and environmental impacts associated with making ethanol. In other words, today's ethanol producers are doing more with less. Natural gas and electricity use at dry mill ethanol plants has fallen nearly 40% since 1995, while consumptive water use has been cut in half.

Meanwhile, producers are getting more out of each bushel of corn processed. Today's dry mill plants produce 2.8-2.9 gallons of ethanol per bushel, up more than 15% over the past 20 years. In addition, each bushel processed by a dry mill is also yielding about 0.6 pounds of corn distillers oil, a feedstock for biodiesel or animal feed. Ethanol producers also captured and marketed 2.5 million tons of carbon dioxide in 2015.

But efficiency improvements aren't just occurring at the ethanol plant–they are also happening on the farm. Thanks to new seed technologies and more efficient equipment, corn growers are seeing dramatic gains in yield per acre. At the same time, the amount of fertilizer, energy, land, and crop protection inputs required to produce a bushel of corn continues to fall precipitously.



Source: U.S. Dept. of Agriculture

The result of these improvements is a smaller overall carbon footprint. According to the U.S. Department of Energy's GREET model, corn ethanol from an average dry mill reduces greenhouse gas (GHG) emissions by 34% compared to gasoline—even when hypothetical land use change emissions are included. Comparing direct emissions only, average corn ethanol reduces GHG emissions by 44% relative to gasoline.

"The RFS2 has resulted in significant GHG reductions, with cumulative CO_2 savings of 354 million metric tonnes over the period of implementation."

– Life Cycle Associates, LLC

Corn Ethanol Efficiency Indicators

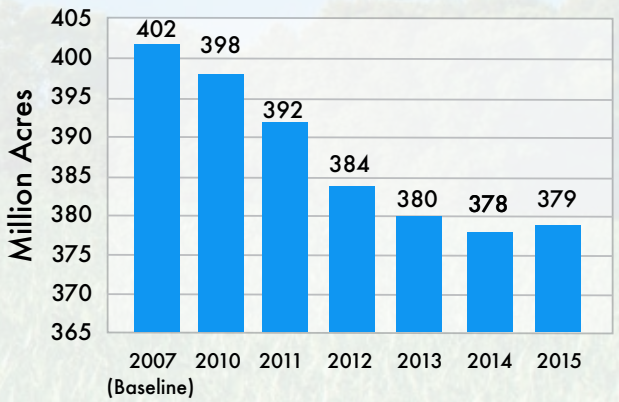
		1995	2015	% Change
Ethanol Yield – Dry Mill	*gals. ethanol/bushel corn*	2.55	2.83	11%
Ethanol Yield – Wet Mill	*gals. ethanol/bushel corn*	2.50	2.61	4%
Ethanol Yield – Industry Average	*gals. ethanol/bushel corn*	2.52	2.81	12%
Dry Mill Natural Gas Use	*BTU/gal. ethanol*	37,000	23,862	-36%
Dry Mill Electricity Use	*kWh/gal. ethanol*	1.20	0.75	-38%
Dry Mill Water Use	*gal. water/gal. ethanol*	5.5	2.7	-51%
Average Corn Yield	*bushels/acre*	113.5	168.4	48%
Corn Production	*million bushels*	7,400	13,601	84%
Nitrogen Fertilizer Application	*pounds/bushel*	1.15	0.83	-28%
Ethanol per Corn Acre	*gals./acre*	286	473	65%

Source: U.S. Dept. of Agriculture and U.S. Dept. of Energy

The use of ethanol in gasoline in 2015 reduced CO_2-equivalent greenhouse gas emissions from transportation by 41.2 million metric tons – equivalent to removing 8.7 million cars from the road for an entire year.

– RFA analysis using U.S. Dept. of Energy GREET model

U.S. EPA Estimate of Agricultural Land Use



U.S. EPA has determined that aggregate agricultural land use continues to fall since adoption of the RFS2 in 2007, disproving the notion that ethanol growth would cause cropland expansion.

Source: U.S. Environmental Protection Agency

LOW CARBON FUEL REGULATIONS

ETHANOL'S CARBON CREDENTIALS

Low carbon fuel policies were back in the headlines in 2015, as California re-adopted its LCFS and Oregon, Washington, and British Columbia took steps to advance their own programs. These regulations seek to reduce the carbon intensity (CI) of transportation fuels by requiring fuel suppliers to substitute lower-carbon fuels for petroleum.

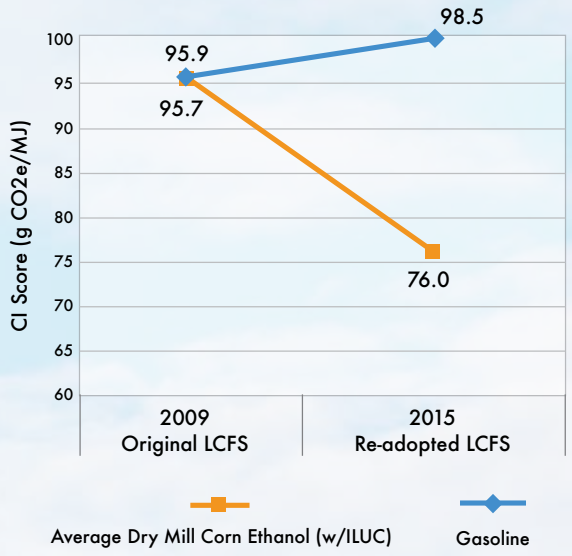
Under the LCFS structure, each different fuel type is assigned a CI "score" based on its estimated lifecycle greenhouse gas (GHG) emissions. When fair and consistent analytical boundaries are used to determine CI scores, ethanol emerges as an attractive fuel option for meeting compliance obligations. However, when hypothetical "indirect emissions" are unfairly added to the CI scores for crop-based biofuels—but not for any other fuels—the scales are wrongly tipped toward other fuel options. Unfortunately, California's LCFS continues to penalize grain ethanol for emissions from supposed indirect land use changes (ILUC), despite a lack of evidence that such land conversions are occurring.

Still, even with a discriminatory ILUC penalty, grain-based ethanol has made a huge contribution to compliance with the California LCFS. When the LCFS was adopted in 2009, California regulators believed corn ethanol would soon be pushed out of the state due to its assigned CI score and the ILUC penalty. However, U.S. producers have demonstrated that the actual CI of their ethanol is much lower than California regulators anticipated, and grain ethanol has accounted for 48% of the carbon credits generated under the LCFS. Moving forward, however, compliance with the California LCFS becomes much harder, as CI reduction requirements ramp up quickly.

Meanwhile, Oregon adopted regulations in 2015 that will begin the enforcement phase of its program in 2017. Oregon also broke from California by adopting a much lower ILUC penalty for corn ethanol, based on analysis by several universities and the Department of Energy. Washington regulators released a draft LCFS proposal, but the state's legislature voted to suspend the program. And British Columbia continued to enforce an LCFS that pragmatically does not include any indirect emissions penalties at all.

CALIFORNIA LCFS

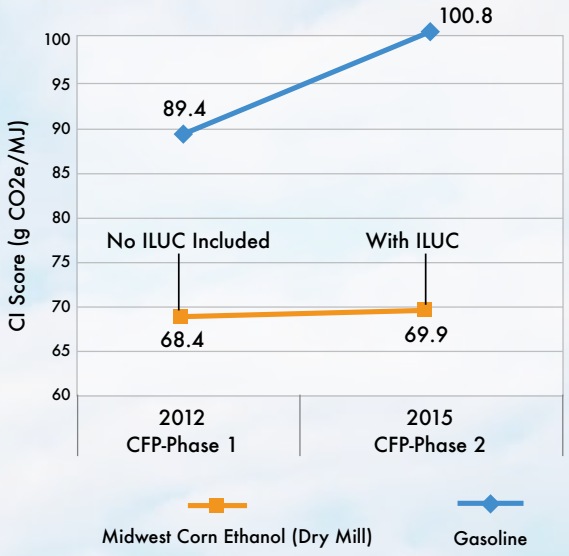
Changes to Assumed CI Scores for Gasoline and Average Dry Mill Corn Ethanol



Source: California Air Resources Board
(2015 Corn Ethanol based on Temporary Fuel Pathway Code)

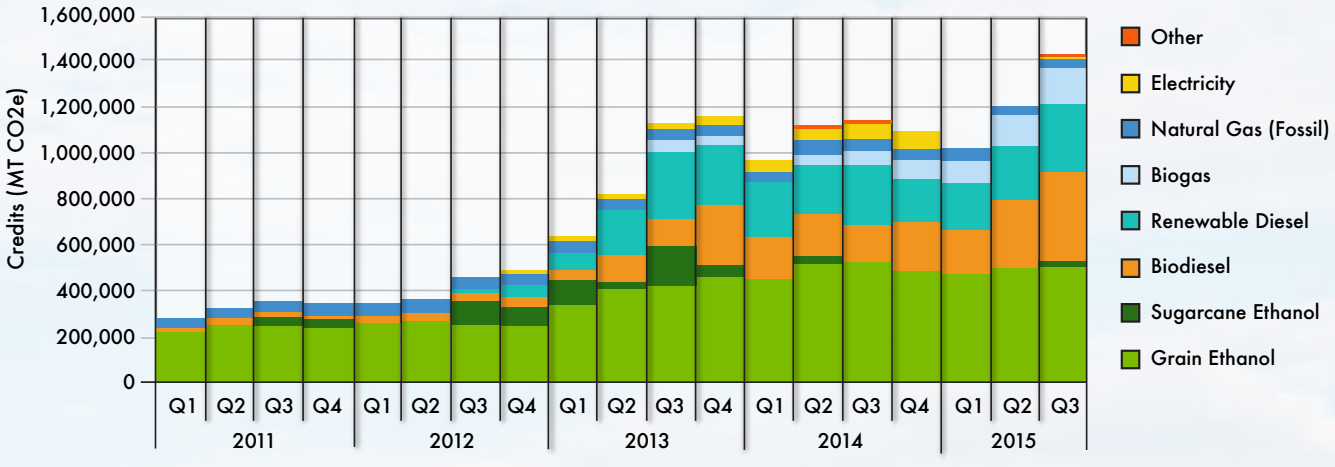
OREGON CFP

Changes to Assumed CI Scores for Gasoline and Midwest Dry Mill Corn Ethanol



Source: Oregon Dept. of Environmental Quality

California LCFS Credit Generation by Fuel Type



Source: California Air Resources Board

RFA COMMITTEES, EDUCATION AND OUTREACH

ACTION, ADVOCACY, AND EXPERIENCE

Since 1981, the RFA has proudly served as the ethanol industry's national trade association. The Association advances policy and regulatory initiatives that support industry growth, educates key decision-makers, serves as the voice of the industry through public and media relations efforts, and provides the technical foundation to move the industry forward. RFA's Board of Directors is solely comprised of ethanol producers who are ascribed one vote per company. In addition, a broad cross-section of RFA producer, associate, and supporting members participate on standing committees that address issues important to the industry.

The RFA Technical Committee focuses on fuel specifications and standards development by ASTM International, National Conference of Weights and Measures, ISO, Canadian General Standards Board, and other organizations. Committee members monitor technical issues impacting day-to-day plant operations, such as storage and handling, transportation, and fuel quality, as well as state and regional regulations and international blending practices.

The RFA Co-Products Committee focuses on issues relevant to co-products from ethanol production, including distillers grains, corn distillers oil, corn gluten, carbon dioxide and other products. Committee members address operational and regulatory issues concerning production, storage and handling, transportation, international trade, animal nutrition, and animal feed safety.

The RFA Plant & Employee Safety Committee leads the industry in advocating safe practices in ethanol production, storage and handling, transportation, and use. Committee members monitor and share information on hazardous materials, safety standards, and federal and state safety regulations. The Committee also supports continuing education for every link of the ethanol supply chain.

The RFA Environmental Compliance Committee examines and educates industry stakeholders on the implementation of environmental regulations for production, storage and handling, and transportation of ethanol. The committee tackles complex regulatory issues and provides guidance to members.

The RFA Export Committee assesses opportunities and challenges in growing international demand for U.S. ethanol. The group advocates for free and fair trade policies, examines technical and regulatory barriers, interacts with U.S. trade officials, and monitors data and trends in the global trade.

The Renewable Fuels PAC builds a stronger voice for American-made renewable fuels on Capitol Hill. Organized and operated by RFA members and staff, this Political Action Committee promotes consistent and forward-looking public policy essential to the growth and evolution of the industry by focusing on federal election activity.

Navigating the Regulatory Landscape

Nearly every facet of the ethanol industry–from production at the facility to consumption in the vehicle–is affected by a plethora of federal and state regulations. Ethanol producers face a multitude of registration, reporting, recordkeeping, and compliance requirements, and the regulatory landscape is constantly changing and is becoming more complex. Providing analyses of important regulations and technical issues has long been a hallmark of the RFA, and we strive to ensure our member companies know exactly how their operations–and industry–will be affected by new, pending, or amended regulations. On behalf of its members, RFA staff frequently interacts with the following regulatory bodies (among others):

- Alcohol Tobacco Tax and Trade Bureau (TTB)
- Federal Trade Commission (FTC)
- Occupational Safety & Health Administration (OSHA)
- U.S. Department of Agriculture (USDA)
- U.S. Department of Commerce (DOC)
- U.S. Department of Energy (DOE)
- U.S. Department of Transportation (DOT)
- U.S. Environmental Protection Agency (EPA)
- U.S. Food and Drug Administration (FDA)

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Staff bios are available at www.EthanolRFA.org/about/staff

As the leading trade association for America's ethanol industry, we work to advance the development, production & use of fuel ethanol and its co-products and to raise awareness of the benefits of renewable fuels. Our expertise, advocacy and member services focus on these areas:

PUBLIC POLICY & REGULATION

FUEL ETHANOL TECHNICAL ISSUES

TRADE POLICY & EXPORT PROMOTION

SAFETY TRAINING & EMERGENCY RESPONSE

U.S. MARKET DEVELOPMENT

RESEARCH & ANALYSIS

COMMUNICATIONS, MEDIA & PUBLIC RELATIONS

CONSUMER ADVERTISING & EDUCATION

STAKEHOLDER ENGAGEMENT

RFF RENEWABLE FUELS FOUNDATION

The Renewable Fuels Foundation (RFF) addresses the education, research and strategic planning needs of the U.S. fuel ethanol industry. RFF collaborates with industry and academic stakeholders and public policymakers to address issues related to new uses, new feedstocks and new technologies, with the goal of assuring a growing and healthy renewable fuels industry well into the future.

www.renewablefuels-foundation.org

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www.icminc.com

Illinois Corn Marketing Board
www.ilcorn.org

Indiana Corn Marketing Council
www.incorn.org

Innospec Fuel Specialties LLC
www.innospecinc.com

Inspectorate America Corporation
www.inspectorate.com

INTL FCStone Inc.
www.intlfcstone.com

Iowa Corn Growers Association
www.iowacorn.org

Iowa Renewable Fuels Association
www.iowarfa.org

Kansas Corn Commission
www.ksgrains.com

KATZEN International, Inc.
www.katzen.com

Kenan Advantage Group, Inc.
www.thekag.com

Kentucky Corn Promotion Council
www.kycorn.org

Kinder Morgan, Inc.
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www.midwestlabs.com

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www.mnbiofuels.org

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www.murexltd.com

Nalco Co.
www.nalco.com

National Corn Growers Association
www.ncga.com

National Sorghum Producers
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North Dakota Corn Council
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Ohio Corn Marketing Program
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www.protecfuel.com

PRX Geographic Inc./The ProExporter Network
www.prxgeo.com

Renewable Products Marketing Group, LLC
www.rpmgllc.com

RSM US LLP
http://www.rsmus.com

South Dakota Corn Utilization Council
www.sdcorn.org

Syngenta
www.syngenta.com

Union Pacific Railroad Co.
www.up.com

U.S. Water Services, Inc.
www.uswaterservices.com

United Sorghum Checkoff Program
www.sorghumcheckoff.com

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www.bsc.nodak.edu

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www.coloradofarmbureau.com

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www.micorn.org

Distillers Grains Technology Council
www.distillersgrains.org

Downstream Alternatives, Inc.

Ethanol Producers And Consumers
www.ethanolmt.org

Great Falls Montana Development Authority
www.gfdevelopment.org

Iowa Central Fuel Testing Laboratory
www.iowafuellab.com

Jamestown/Stutsman Development Corp.
www.growingjamestown.com

Kentucky Energy & Environment Cabinet–Department for Energy Development & Independence
www.eec.ky.gov

Maryland Grain Producers Utilization Board
www.marylandgrain.com

Michigan State University–Department of Agricultural, Food, and Resource Economics
www.afre.msu.edu

Minnesota Department of Agriculture
www.mda.state.mn.us

Mississippi State University–Department of Forestry
www.cfr.msstate.edu/forestry

Missouri Corn Growers Association
www.mocorn.org

Morton College
www.morton.edu

National Corn-To-Ethanol Research Center at SIUE
www.ethanolresearch.com

Renew Kansas
www.renewkansas.com

South Dakota Corn Growers Association
www.sdcorn.org

Southeastern Illinois College
www.sic.edu

Steele-Waseca Cooperative Electric
www.swce.coop

Sugar Processing Research Institute
www.spriinc.org

Texas Renewable Energy Industry Alliance
www.treia.org

The New School–Milano School of International Affairs, Management, and Urban Policy
www.newschool.edu/milano

United Association
www.ua.org

Water Assurance Technology Energy Resources
www.waterc3.com

Western Iowa Tech Community College–National Boiler Training & Renewable Fuels Institute
www.witcc.edu

Wisconsin Pipe Trades
www.wipipetrades.org

Company	Location	State	Feedstock	Production Capacity (mgy)	Operating Production (mgy)	Under Construction/ Expansion Capacity (mgy)
ABE South Dakota, LLC	Aberdeen	SD	Corn	55	55	
ABE South Dakota, LLC	Huron	SD	Corn	32	32	
Abengoa Bioenergy/Biomass of Kansas	Hugoton	KS	Cellulosic Biomass	25		
Abengoa Bioenergy Corp.	Colwich	KS	Corn/Sorghum	25		
Abengoa Bioenergy Corp.	Portales	NM	Corn/Sorghum	30		
Abengoa Bioenergy Corp.	York	NE	Corn	56	56	
Abengoa Bioenergy of Illinois	Madison	IL	Corn	90	90	
Abengoa Bioenergy of Indiana	Mt. Vernon	IN	Corn	90	90	
Abengoa Bioenergy of Nebraska	Ravenna	NE	Corn	90	90	
Absolute Energy, L.L.C.	St. Ansgar	IA	Corn	115	115	
Ace Ethanol LLC	Stanley	WI	Corn	48	48	
Adkins Energy, LLC	Lena	IL	Corn	52	52	
Aemetis	Keyes	CA	Corn/Sorghum	60	60	
Al-Corn Clean Fuel	Claremont	MN	Corn	50	50	
Archer Daniels Midland Co. Plant 1	Cedar Rapids	IA	Corn	300	300	
Archer Daniels Midland Co. Plant 2	Cedar Rapids	IA	Corn	240	240	
Archer Daniels Midland Co.	Clinton	IA	Corn	238	238	
Archer Daniels Midland Co. Plant 1	Columbus	NE	Corn	100	100	
Archer Daniels Midland Co. Plant 2	Columbus	NE	Corn	313	313	
Archer Daniels Midland Co.	Decatur	IL	Corn	300	300	
Archer Daniels Midland Co.	Marshall	MN	Corn	40	40	
Archer Daniels Midland Co.	Peoria	IL	Corn	185	185	
Arkalon Ethanol LLC	Liberal	KS	Corn	110	110	
Badger State Ethanol, LLC	Monroe	WI	Corn	57	57	
Big River Resources Boyceville, LLC	Boyceville	WI	Corn	57	57	
Big River Resources Galva, LLC	Galva	IL	Corn	110	110	
Big River Resources West Burlington, LLC	W. Burlington	IA	Corn	105	105	
Big River United Energy, LLC	Dyersville	IA	Corn	110	110	
Blue Flint Ethanol	Underwood	ND	Corn	65	65	
Bonanza BioEnergy, LLC	Garden City	KS	Corn/Sorghum	55	55	
Bridgeport Ethanol	Bridgeport	NE	Corn	50	50	
Buffalo Lake Advanced Biofuels, LLC	Buffalo Lake	MN	Corn	18		
Bushmills Ethanol Inc.	Atwater	MN	Corn	65	65	
Calgren Renewable Fuels LLC	Pixley	CA	Corn	55	55	
Carbon Green BioEnergy	Woodbury	MI	Corn	55	55	
Cardinal Ethanol	Union City	IN	Corn	100	100	
Cargill, Inc.	Blair	NE	Corn	210	210	
Cargill, Inc.	Eddyville	IA	Corn	35	35	
Cargill, Inc.	Ft. Dodge	IA	Corn	115	115	
Center Ethanol Company, LLC	Sauget	IL	Corn	54	54	
Central Indiana Ethanol, LLC	Marion	IN	Corn	55	55	
Central MN Renewables, LLC	Little Falls	MN	Corn	22	22	
Chief Ethanol Fuels, Inc.	Hastings	NE	Corn	70	70	
Chippewa Valley Ethanol, Co.	Benson	MN	Corn	50	50	
CHS Inc.	Annawan	IL	Corn	125	125	
CHS Inc.	Rochelle	IL	Corn	133	133	
Columbia Pacific Bio-Refinery	Clatskanie	OR	Corn	108		
Commonwealth Agri-Energy, LLC	Hopkinsville	KY	Corn	33	33	
Corn Plus, LLP	Winnebago	MN	Corn	49	49	
Corn, LP	Goldfield	IA	Corn	60	60	
Cornhusker Energy Lexington, LLC	Lexington	NE	Corn	50	50	
Dakota Ethanol, LLC	Wentworth	SD	Corn	48	48	
Dakota Spirit AgEnergy LLC	Spiritwood	ND	Corn	65	65	
DENCO II, LLC	Morris	MN	Corn	24	24	

Company	Location	State	Feedstock	Production Capacity (mgy)	Operating Production (mgy)	Under Construction/ Expansion Capacity (mgy)
Diamond Ethanol	Levelland	TX	Corn	40	40	
Didion Ethanol LLC	Cambria	WI	Corn	50	50	
Dubay Biofuels-Greenwood, LLC	Greenwood	WI	Cheese Whey			5
DuPont Cellulosic Ethanol	Nevada	IA	Cellulosic Biomass	30	30	
E Energy Adams, LLC	Adams	NE	Corn	50	50	
East Kansas Agri-Energy, LLC	Garnett	KS	Corn	42	42	
Elkhorn Valley Ethanol, LLC	Norfolk	NE	Corn	45	45	
Ergon BioFuels, LLC	Vicksburg	MS	Corn	54	54	
ESE Alcohol Inc.	Leoti	KS	Seed Corn	2	2	
Fiberight LLC	Blairstown	IA	Cellulosic Biomass	6		
Flint Hills Resources, LLC	Arthur	IA	Corn	120	120	
Flint Hills Resources, LLC	Camilla	GA	Corn	120	120	
Flint Hills Resources, LLC	Fairbank	IA	Corn	120	120	
Flint Hills Resources, LLC	Fairmont	NE	Corn	120	120	
Flint Hills Resources, LLC	Iowa Falls	IA	Corn	100	100	
Flint Hills Resources, LLC	Menlo	IA	Corn	120	120	
Flint Hills Resources, LLC	Shell Rock	IA	Corn	120	120	
Fox River Valley Ethanol LLC	Oshkosh	WI	Corn	50	50	
Front Range Energy, LLC	Windsor	CO	Corn	40	40	
Gevo	Luverne	MN	Corn	22	22	
Glacial Lakes Energy, LLC	Watertown	SD	Corn	110	110	
Glacial Lakes Energy, LLC	Mina	SD	Corn	110	110	
Golden Cheese Company of California	Corona	CA	Cheese Whey	5		
Golden Grain Energy, LLC	Mason City	IA	Corn	115	115	
Golden Triangle Energy, LLC	Craig	MO	Corn	20	5	
Grain Processing Corp.	Muscatine	IA	Corn	20	20	
Grain Processing Corp.	Washington	IN	Corn	20	20	
Granite Falls Energy, LLC	Granite Falls	MN	Corn	52	52	
Green Plains Inc.	Atkinson	NE	Corn	53	53	
Green Plains Inc.	Bluffton	IN	Corn	120	120	
Green Plains Inc.	Central City	NE	Corn	106	106	
Green Plains Inc.	Fairmont	MN	Corn	119	119	
Green Plains Inc.	Hereford	TX	Corn	110	110	
Green Plains Inc.	Hopewell	VA	Corn	60		
Green Plains Inc.	Lakota	IA	Corn	112	112	
Green Plains Inc.	Obion	TN	Corn	120	120	
Green Plains Inc.	Ord	NE	Corn	55	55	
Green Plains Inc.	Fergus Falls	MN	Corn	60	60	
Green Plains Inc.	Riga	MI	Corn	60	60	
Green Plains Inc.	Shenandoah	IA	Corn	69	69	
Green Plains Inc.	Superior	IA	Corn	60	60	
Green Plains Inc.	Wood River	NE	Corn	121	121	
Guardian Energy, LLC	Janesville	MN	Corn	110	110	
Guardian Lima, LLC	Lima	OH	Corn	54	54	
Guardian Hankinson, LLC	Hankinson	ND	Corn	132	132	
Heartland Corn Products	Winthrop	MN	Corn	100	100	
Heron Lake BioEnergy, LLC	Heron Lake	MN	Corn	59	59	
Highwater Ethanol, LLC	Lamberton	MN	Corn	58	58	
Homeland Energy Solutions, LLC	Lawler	IA	Corn	100	100	
Husker Ag, LLC	Plainview	NE	Corn	75	75	
Illinois Corn Processing Co.	Pekin	IL	Corn	90	90	
INEOS Bio USA, LLC	Vero Beach	FL	Cellulosic Biomass	8		
Iroquois Bio-Energy Company, LLC	Rensselaer	IN	Corn	50	50	
KAAPA Ethanol, LLC	Minden	NE	Corn	59	59	
Kansas Ethanol LLC	Lyons	KS	Corn	60	60	
Land O' Lakes	Melrose	MN	Cheese Whey	3	3	

Company	Location	State	Feedstock	Production Capacity (mgy)	Operating Production (mgy)	Under Construction/ Expansion Capacity (mgy)
LifeLine Foods, LLC	St. Joseph	MO	Corn	50	50	
Lincolnland Agri-Energy, LLC	Palestine	IL	Corn	48	48	
Lincolnway Energy, LLC	Nevada	IA	Corn	55	55	
Little Sioux Corn Processors, L.P.	Marcus	IA	Corn	92	92	
Louis Dreyfus Commodities	Grand Junction	IA	Corn	100	100	
Mano Metate Grain & Energy Commodities	Benton	IL	Corn/Sorghum			7
Marquis Energy LLC	Hennepin	IL	Corn	150	150	150
Marquis Energy-Wisconsin, LLC	Necedah	WI	Corn	60	60	
Marysville Ethanol, LLC	Marysville	MI	Corn	50	50	
Merrick & Company	Aurora	CO	Brewery Waste	5	5	
Mid-America BioEnergy, LLC	Madrid	NE	Corn	44	44	
Mid-Missouri Energy, Inc.	Malta Bend	MO	Corn	50	50	
Midwest Renewable Energy, LLC	Sutherland	NE	Corn	28		
Nebraska Corn Processing, LLC	Cambridge	NE	Corn	44	44	
Nesika Energy, LLC	Scandia	KS	Corn	21	21	
Noble Americas South Bend Ethanol	South Bend	IN	Corn	102	102	
NuGen Energy, L.L.C.	Marion	SD	Corn	110	110	
One Earth Energy	Gibson City	IL	Corn	100	100	
Pacific Ethanol Inc. Plant 1	Aurora	NE	Corn	45	45	
Pacific Ethanol Inc. Plant 2	Aurora	NE	Corn	110	110	
Pacific Ethanol Inc.	Boardman	OR	Corn	40	40	
Pacific Ethanol Inc.	Burley	ID	Corn	60	60	
Pacific Ethanol Inc.	Canton	IL	Corn	38		
Pacific Ethanol Inc.	Madera	CA	Corn/Sorghum	40	40	
Pacific Ethanol Inc. Plant 1	Pekin	IL	Corn	100	100	
Pacific Ethanol Inc. Plant 2	Pekin	IL	Corn	60	60	
Pacific Ethanol Inc.	Stockton	CA	Corn/Sorghum	60	60	
Parallel Products	Louisville	KY	Beverage Waste	3	3	
Parallel Products	R. Cucamonga	CA	Beverage Waste	3	3	
Penford Products (Ingredion Inc.)	Cedar Rapids	IA	Corn	45	45	
Pennsylvania Grain Processing, LLC	Clearfield	PA	Corn	110	110	
Pinal Energy, LLC	Maricopa	AZ	Corn	50	50	
Pine Lake Corn Processors LLC	Steamboat Rock	IA	Corn	30	30	
Plymouth Energy, LLC	Merrill	IA	Corn	50	50	
POET Biorefining - Alexandria	Alexandria	IN	Corn	68	68	
POET Biorefining - Ashton	Ashton	IA	Corn	56	56	
POET Biorefining - Big Stone	Big Stone	SD	Corn	79	79	
POET Biorefining - Bingham Lake	Bingham Lake	MN	Corn	35	35	
POET Biorefining - Caro	Caro	MI	Corn	53	53	
POET Biorefining - Chancellor	Chancellor	SD	Corn	110	110	
POET Biorefining - Cloverdale	Cloverdale	IN	Corn	92	92	
POET Biorefining - Coon Rapids	Coon Rapids	IA	Corn	54	54	
POET Biorefining - Corning	Corning	IA	Corn	65	65	
POET Biorefining - Emmetsburg	Emmetsburg	IA	Corn	55	55	
POET Biorefining - Fostoria	Fostoria	OH	Corn	68	68	
POET Biorefining - Glenville	Albert Lea	MN	Corn	42	42	
POET Biorefining - Gowrie	Gowrie	IA	Corn	69	69	
POET Biorefining - Groton	Groton	SD	Corn	53	53	
POET Biorefining - Hanlontown	Hanlontown	IA	Corn	56	56	
POET Biorefining - Hudson	Hudson	SD	Corn	56	56	
POET Biorefining - Jewell	Jewell	IA	Corn	69	69	
POET Biorefining - Laddonia	Laddonia	MO	Corn	50	50	
POET Biorefining - Lake Crystal	Lake Crystal	MN	Corn	56	56	
POET Biorefining - Leipsic	Leipsic	OH	Corn	68	68	
POET Biorefining - Macon	Macon	MO	Corn	46	46	
POET Biorefining - Marion	Marion	OH	Corn	68	68	

Company	Location	State	Feedstock	Production Capacity (mgy)	Operating Production (mgy)	Under Construction/ Expansion Capacity (mgy)
POET Biorefining - Mitchell	Mitchell	SD	Corn	68	68	
POET Biorefining - North Manchester	North Manchester	IN	Corn	68	68	
POET Biorefining - Portland	Portland	IN	Corn	68	68	
POET Biorefining - Preston	Preston	MN	Corn	46	46	
POET Research Center	Scotland	SD	Corn	11	11	
Prairie Horizon Agri-Energy, LLC	Phillipsburg	KS	Corn	40	40	
Pratt Energy	Pratt	KS	Corn	55	55	
Project LIBERTY (POET/DSM)	Emmetsburg	IA	Cellulosic Biomass	20		
Quad County Corn Processors	Galva	IA	Corn/Cellulosic Biomass	37	37	
Red River Energy LLC	Rosholt	SD	Corn	25	25	
Red Trail Energy, LLC	Richardton	ND	Corn	50	50	
Redfield Energy, LLC	Redfield	SD	Corn	55	55	
Reeve Agri-Energy	Garden City	KS	Corn/Sorghum	12	12	
Show Me Ethanol, LLC	Carrollton	MO	Corn	55	55	
Siouxland Energy Cooperative	Sioux Center	IA	Corn	60	60	
Siouxland Ethanol	Jackson	NE	Corn	50	50	
Southwest Iowa Renewable Energy, LLC	Council Bluffs	IA	Corn	130	130	
Spectrum Business Ventures Inc	Mead	NE	Corn	25		
Sterling Ethanol LLC	Sterling	CO	Corn	42	42	
Summit Natural Energy	Cornelius	OR	Waste Sugars/Starch	2	2	
Sunoco Ethanol	Fulton	NY	Corn	114	114	
Tate & Lyle	Loudon	TN	Corn	105	105	
Tharaldson Ethanol	Casselton	ND	Corn	153	153	
The Andersons Albion Ethanol LLC	Albion	MI	Corn	55	55	
The Andersons Clymers Ethanol LLC	Clymers	IN	Corn	110	110	
The Andersons Denison Ethanol LLC	Denison	IA	Corn	55	55	
The Andersons Marathon Ethanol LLC	Greenville	OH	Corn	110	110	
Three Rivers Energy, LLC	Coshocton	OH	Corn	50	50	
Trenton Agri Products LLC	Trenton	NE	Corn	40	40	
Tyton NC Biofuels LLC	Raeford	NC	Corn/Tobacco	60		
United Ethanol, LLC	Milton	WI	Corn	47	47	
United Wisconsin Grain Producers, LLC	Friesland	WI	Corn	58	58	
Valero Renewable Fuels	Mount Vernon	IN	Corn	110	110	
Valero Renewable Fuels-Albert City	Albert City	IA	Corn	110	110	
Valero Renewable Fuels-Albion	Albion	NE	Corn	110	110	
Valero Renewable Fuels-Aurora	Aurora	SD	Corn	110	110	
Valero Renewable Fuels-Bloomingburg	Bloomingburg	OH	Corn	110	110	
Valero Renewable Fuels-Charles City	Charles City	IA	Corn	110	110	
Valero Renewable Fuels-Fort Dodge	Fort Dodge	IA	Corn	110	110	
Valero Renewable Fuels-Hartley	Hartley	IA	Corn	110	110	
Valero Renewable Fuels-Jefferson	Jefferson	WI	Corn	110	110	
Valero Renewable Fuels-Linden	Linden	IN	Corn	110	110	
Valero Renewable Fuels-Welcome	Welcome	MN	Corn	110	110	
Western New York Energy LLC	Medina	NY	Corn	55	55	
Western Plains Energy LLC	Campus	KS	Corn	50	50	
White Energy	Hereford	TX	Corn/Sorghum	120	120	
White Energy	Plainview	TX	Corn	120	120	
White Energy	Russell	KS	Sorghum/Wheat Starch	55	55	
Wyoming Ethanol	Torrington	WY	Corn	10		
Yuma Ethanol	Yuma	CO	Corn	40	40	
U.S. Totals				15,594	15,113	162

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