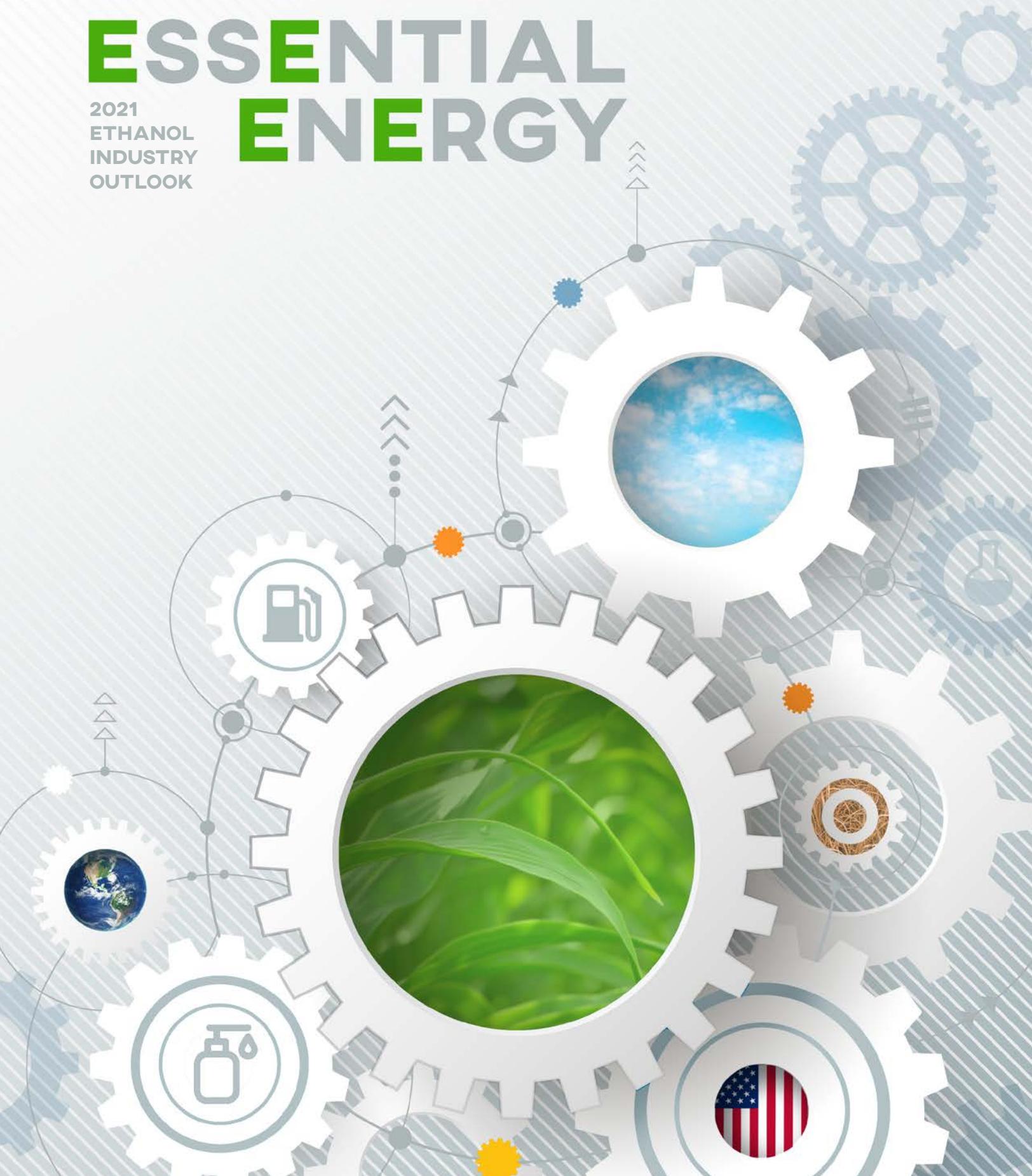


# ESSENTIAL ENERGY

2021  
ETHANOL  
INDUSTRY  
OUTLOOK



## RFA OFFICERS



**RFA Chairperson**  
**Jeanne McCaherty**  
*Guardian Energy Management LLC*



**RFA Vice Chairman**  
**Erik Huschitt**  
*Badger State Ethanol LLC*



**RFA Secretary**  
**Rick Schwarck**  
*Absolute Energy LLC*



**RFA Treasurer**  
**Charles Wilson**  
*Trenton Agri Products LLC*

**RFA President**  
**Geoff Cooper**  
*Renewable Fuels Association*

## RFA BOARD OF DIRECTORS

Rick Schwarck	<i>Absolute Energy LLC</i>	<i>absenergy.org</i>
Neal Kemmet	<i>Ace Ethanol LLC</i>	<i>aceethanol.com</i>
Ray Baker	<i>Adkins Energy LLC</i>	<i>adkinsenergy.com</i>
Eric McAfee	<i>Aemetis Inc.</i>	<i>aemetis.com</i>
Randall Doyal	<i>Al-Corn Clean Fuel LLC</i>	<i>al-corn.com</i>
Jim Sneed	<i>Alto Ingredients Inc.</i>	<i>altoingredients.com</i>
Erik Huschitt	<i>Badger State Ethanol LLC</i>	<i>badgerstateethanol.com</i>
Jim Leiting	<i>Big River Resources LLC</i>	<i>bigriverresources.com</i>
Chad Friese	<i>Chippewa Valley Ethanol Co.</i>	<i>cvec.com</i>
Steve Markham	<i>CHS Inc.</i>	<i>chsinc.com</i>
Ryan Drook	<i>CIE</i>	<i>cie.us</i>
Mick Henderson	<i>Commonwealth Agri-Energy LLC</i>	<i>commonwealthagrienergy.com</i>
Scott Mundt	<i>Dakota Ethanol LLC</i>	<i>dakotaethanol.com</i>
John Didion	<i>Didion Ethanol LLC</i>	<i>didionmilling.com</i>
Carl Sitzmann	<i>E Energy Adams LLC</i>	<i>eenergyadams.com</i>
Bill Pracht	<i>East Kansas Agri-Energy LLC</i>	<i>ekaellc.com</i>
Bill Paulsen	<i>ELEMENT LLC*</i>	<i>elementbiofuels.com</i>
Dave Sovereign	<i>Golden Grain Energy LLC</i>	<i>ggecorn.com</i>
Mark Ricketts	<i>Grain Processing Corp.</i>	<i>grainprocessing.com</i>
Steve Christensen	<i>Granite Falls Energy LLC</i>	<i>granitefallsenergy.com</i>
Jeanne McCaherty	<i>Guardian Energy Management LLC</i>	<i>guardiannrg.com</i>
Gary Anderson	<i>Heartland Corn Products</i>	<i>heartlandcorn.com</i>
Brian Kletscher	<i>Highwater Ethanol LLC</i>	<i>highwaterethanol.com</i>
Seth Harder	<i>Husker Ag LLC</i>	<i>huskerag.com</i>
Chuck Woodside	<i>KAAPA Ethanol Holdings LLC</i>	<i>kaapaethanol.com</i>
Eric Mosbey	<i>Lincolnland Agri-Energy LLC</i>	<i>lincolnlandagrienergy.com</i>
Chris Wilson	<i>Mid-Missouri Energy LLC</i>	<i>midmissourienergy.com</i>
Thomas Corle	<i>New Energy Blue*</i>	<i>newenergyblue.com</i>
Bob Pasma	<i>Parallel Products</i>	<i>parallelproducts.com</i>
Delayne Johnson	<i>Quad County Corn Processors</i>	<i>quad-county.com</i>
Dana Lewis	<i>Redfield Energy LLC</i>	<i>redfieldenergy.com</i>
Walt Wendland	<i>Ringneck Energy LLC</i>	<i>ringneckenergy.com</i>
Brian Pasbrig	<i>Show Me Ethanol LLC</i>	<i>showmeethanolllc.com</i>
Mike Jerke	<i>Southwest Iowa Renewable Energy LLC</i>	<i>sireethanol.com</i>
Anthony Leiding	<i>Trenton Agri Products LLC</i>	<i>trentonagriproducts.com</i>
Dennis Balakian	<i>West Coast Waste Inc.*</i>	<i>westcoastwaste.info</i>
Tim Winters	<i>Western New York Energy LLC</i>	<i>wnyenergy.com</i>
Derek Peine	<i>Western Plains Energy LLC</i>	<i>wpellc.com</i>

\*Prospective Member

# ESSENTIAL ENERGY



Nobody could have imagined as we left the National Ethanol Conference in Houston a year ago, inspired by the words of former President George W. Bush, that just weeks later the bottom would drop out. No one could have possibly foreseen that a global pandemic would threaten our health, wreak havoc on our economy, and obliterate our fuel markets. But that's exactly what happened, triggering the most challenging time in the U.S. ethanol industry's history.

At the low point in April, more than half of the nation's ethanol production capacity was idled. Total output in 2020 hit a seven-year low, coming in 2 billion gallons below 2019. The industry's revenue losses associated with COVID-19 approached \$4 billion just through November. Such adversity would be enough to crush many industries. But not the U.S. ethanol industry. We survive. We fight. And, ultimately, we thrive.

Indeed, when we look back at 2020, the lesson learned will be less about the pandemic's economic toll than it will be about the incredible way the industry rose to meet the challenge. If the unfortunate and unpredictable events of 2020 taught us anything, it is that ethanol is the embodiment of "Essential Energy."

Even as the wolves were at the door, ethanol producers did everything possible to retain their employees, continue producing the renewable fuel needed to keep the economy moving, and deliver the nutritious feed livestock and poultry producers rely upon. Our fuel and feed proved essential for weathering the COVID storm. The U.S. government agreed, designating the ethanol industry as an "essential and critical" part of our nation's infrastructure and making it possible to keep operating during the pandemic's darkest days.

But we did more than make fuel and feed.

Recognizing the critical need to combat the spread of the virus, many ethanol producers quickly took the steps necessary to produce the high-purity alcohol that comprises roughly 70 percent of every bottle of hand sanitizer. Later in the year, news that vaccines were in development was greeted with understandable enthusiasm; it signaled the beginning of the end of the pandemic. But it also created a new challenge. Much of the vaccine would need to be transported and stored at incredibly low temperatures, necessitating increased supplies of dry ice. Once again, the ethanol industry—which produces 40 percent of the nation's supply of CO<sub>2</sub>, the critical component of dry ice—was called upon to meet the increased demand for an essential product. Once again, we delivered.

As you review the *2021 Ethanol Industry Outlook*, I hope you do so with the same sense of pride I have for our response to the unparalleled challenges of the past year. But more importantly, I hope you recognize that as we move forward, it is with the understanding that tomorrow's challenges of climate change, food and energy security, and rural prosperity will continue to make ethanol an **Essential Energy**.

Sincerely,

A handwritten signature in black ink that reads 'Geoff Cooper'.

**Geoff Cooper, President and CEO**

# FOUR DECADES OF LEADERSHIP

Forty years ago, the U.S. ethanol industry was struggling to become a stable, growing, and viable industry. In the face of oil industry resistance to a new competitor, most understood it would take consistent federal policy to enable reasonable growth in renewable fuels. In early 1981, a small group of companies, representing ethanol producers, investors, feed suppliers, engineering firms, and farmers met to form the Renewable Fuels Association, whose mission it would be to grow the industry.

From just 175 million gallons of production in 1980, the industry has indeed grown to be an essential component of America's fuel and feed complex, with a total production capacity of more than 17 billion gallons of renewable fuel in 2020. Such remarkable success was driven by decades of leadership by the members and staff of the Renewable Fuels Association.

One of the first things the RFA did was form a Technical Committee to establish standards, identify technologies, and assure the safe production, distribution, and marketing of ethanol-blended gasolines. The RFA's Technical Committee was critical to the industry's growth and lasting success. It remains so today.

In the early years, industry growth was driven by a tax incentive available to gasoline marketers, fueling the use of ethanol as a gas extender and octane enhancer, largely by independent marketers looking for a competitive edge against the major oil companies. Beginning with the Clean Air Act Amendments of 1990, however, renewable fuel policy was redirected to meet air quality policy goals. Initially, that meant reducing exhaust emissions of carbon mon-

oxide and ozone-forming VOCs, particularly with the use of reformulated gasoline. Later, with the passage of the Energy Policy Act of 2005, ethanol and other renewable fuels were called upon to address global climate change by, for the first-time, requiring carbon-reducing renewable fuels to be used nationally. The Renewable Fuel Standard (RFS) transformed U.S. energy policy and helped create the robust U.S. ethanol industry we have today.

The RFA was the driving force behind all these foundational policies. Not only did we provide the vision and technical expertise to help formulate and design these policies, but we also provided the shoe leather and elbow grease to get them adopted. The association has evolved over the years, becoming uniquely driven by ethanol producer membership. But it is clear that, for more than 40 years, RFA has provided the consistent leadership and sound technical analysis necessary to meet its original mission—growing the U.S. ethanol industry.

## HISTORICAL BIOREFINERY COUNT & PRODUCTION CAPACITY

Year	Installed Ethanol Biorefineries	Total Installed Production Capacity (mgy)	Average Capacity per Biorefinery (mgy)
2000	56	2,007	36
2005	95	4,294	45
2010	204	14,073	69
2015	214	15,594	73
2020	208	17,436	84

Source: RFA \* As of December for each year specified

**BREAKING BARRIERS:** In October 2020, the RFA continued its leadership by electing Jeanne McCaherty, CEO of Guardian Energy LLC in Minnesota, to be its chairperson, the first woman to lead a national ethanol trade association. McCaherty reflects an evolving view of ethanol leaders who understand that future ethanol policy needs to be focused on today's pressing challenges, addressing global climate change and building new markets here and abroad to assure future growth in the U.S. renewable fuels industry.



PHOTO COURTESY BBI INTERNATIONAL



President Donald Trump visited RFA member company Southwest Iowa Renewable Energy (SIRE) in 2019 to celebrate regulations clearing the way for the year-round availability of E15, the 15 percent ethanol fuel blend. He toured the plant with SIRE CEO Mike Jerke and RFA President and CEO Geoff Cooper.



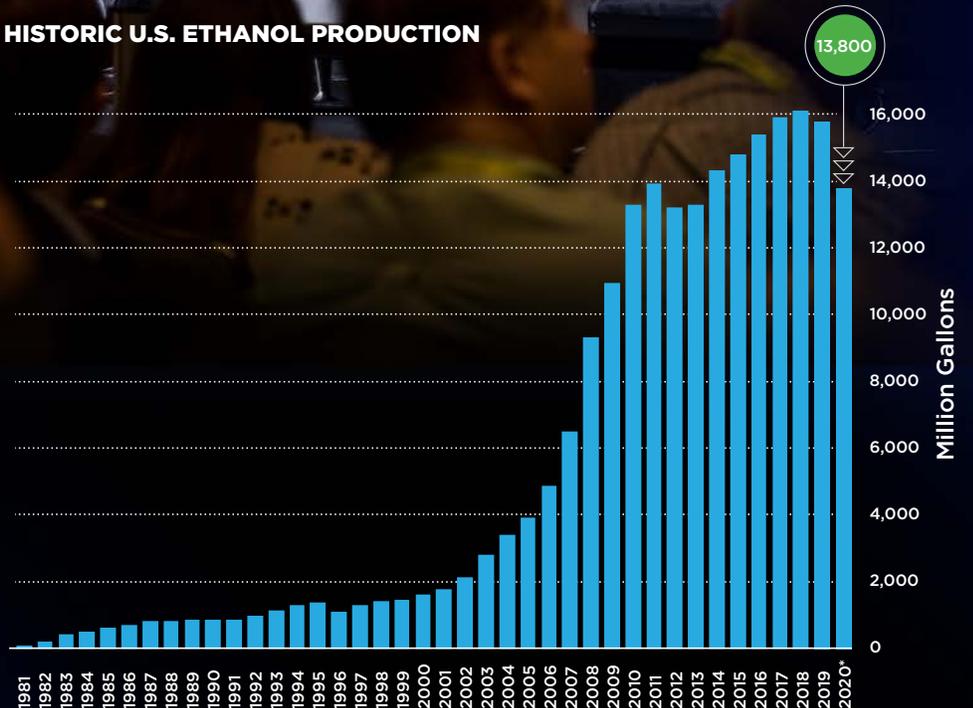
In 2006, President George W. Bush spoke at an RFA meeting in Washington. Fourteen years later, he was interviewed by RFA's Cooper at the 25th Annual National Ethanol Conference.



**Past RFA Chairmen**

- Joseph T. Elvove, 1981-1982
- Paul T. Burke, 1983-1984
- W. Robert Schwandt, 1985
- Art Stuenkel, 1986-1987
- Lauren Hill, 1988
- Linden Shepard, 1989
- Victor Shaio, 1990-1992
- Jack Huggins, 1993-1994
- Rich Jurgensen, 1995
- John Parker, 1996
- Ron Miller, 1997-2001
- Gary Smith, 2002-2003
- Bill Lee, 2004-2005
- Ron Miller, 2006-2007
- Chris Standlee, 2008-2010
- Chuck Woodside, 2011-2012
- Neill McKinstry, 2013-2014
- Randy Doyal, 2015-2016
- Mick Henderson, 2016-2017
- Neil Koehler, 2018-2019

**HISTORIC U.S. ETHANOL PRODUCTION**



Source: RFA and U.S. Energy Information Administration \* Estimated

# WEATHERING THE PERFECT STORM

Over the past several years, these pages have typically been replete with examples of record-setting performance as the U.S. ethanol industry continued its unprecedented growth. Such is not the case for 2020. As the global pandemic crushed gasoline demand here and abroad, demand for ethanol fell precipitously. Annual U.S. ethanol production fell to less than 14 billion gallons for the first time in seven years. At the height of the pandemic-induced market turmoil, more than half of the industry's production capacity was idled. From just March through November, more than 2 billion gallons of demand had been forgone, representing more than 700 million bushels of lost corn demand and revenue losses to the industry of more than \$3.8 billion.

Exports of ethanol fell as well, as the combination of lower world-wide transportation fuel demand and increased protectionism drove exports to a disappointing 1.3 billion gallons, a five-year low. While the decreased demand caused by the pandemic is understandable, the rising protectionism is inexcusable. U.S. government efforts to remove trade barriers in China, Brazil, and elsewhere proved futile as countries chose to sacrifice consumer savings in favor of pleasing special interests.

But the U.S. ethanol industry is nothing if not resilient. Despite the difficult market environment and the public health crisis, many ethanol plants not only survived, but thrived. They added technology allowing them to produce the high-purity ethanol used in hand sanitizer and expanded CO2 capture to meet the rising demand for uses like producing dry ice for transport and storage of the COVID-19 vaccine. Indeed, while 2020 was one of the hardest years in the industry's history, it may also turn out to be the U.S. ethanol sector's finest hour. Ethanol producers were a beacon of hope for their communities and the nation, responding to the crisis and stepping up to be part of the solution in new and innovative ways.

2021 offers an opportunity to turn the page. A vaccine gives hope for a return to a more normal economic environment. And a new Administration and Congress seemingly focused on reducing carbon emissions could provide exciting new market opportunities for renewable fuels like ethanol both here and overseas.

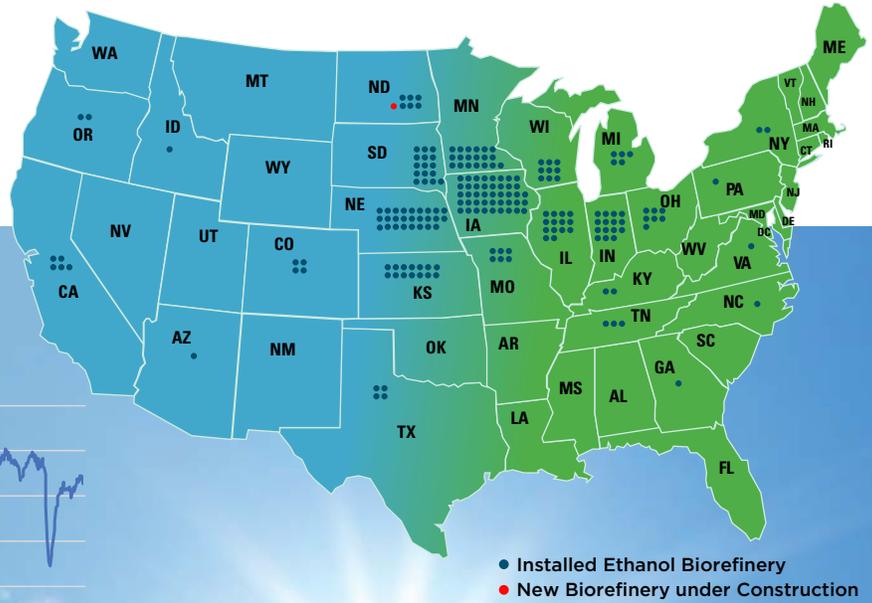
The U.S. ethanol industry, led by the Renewable Fuels Association, is ready for the challenges ahead, whatever they may be. More importantly, we remain poised to seize the opportunities the public discourse about climate change will provide, building new domestic and global demand for ethanol's Essential Energy.

## U.S. ETHANOL PRODUCTION CAPACITY BY STATE (Million Gallons per Year)

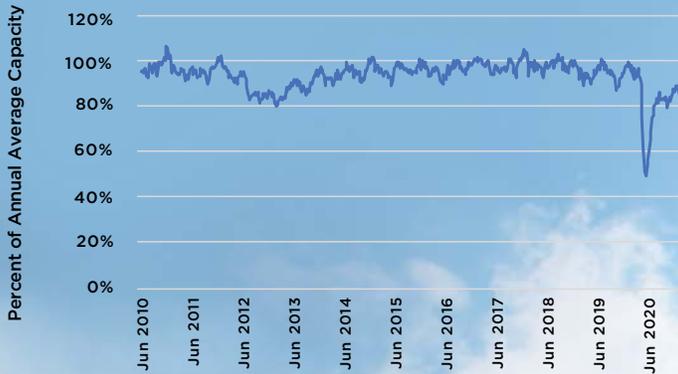
	Existing Production Capacity	Capacity Under Constr./Expansion	Installed Ethanol Biorefineries	Biorefineries Under Constr./Expansion
Iowa	4,593	-	43	-
Nebraska	2,296	-	26	-
Illinois	1,867	-	14	-
Minnesota	1,384	-	19	-
Indiana	1,337	-	15	-
South Dakota	1,223	-	16	-
Ohio	676	-	7	-
Kansas	615	-	14	-
Wisconsin	603	-	9	-
North Dakota	542	16	6	1
Texas	395	-	4	-
Michigan	350	-	5	-
Missouri	287	-	6	-
Tennessee	237	-	3	-
California	217	-	5	-
New York	165	-	2	-
Colorado	143	-	4	-
Georgia	120	-	1	-
Pennsylvania	120	-	1	-
Idaho	60	-	1	-
North Carolina	57	-	1	-
Arizona	55	-	1	-
Kentucky	50	-	2	-
Oregon	42	-	2	-
Virginia	2	-	1	-
<b>TOTAL U.S.</b>	<b>17,436</b>	<b>16</b>	<b>208</b>	<b>1</b>

Source: RFA

**U.S. ETHANOL BIREFINERIES BY STATE**

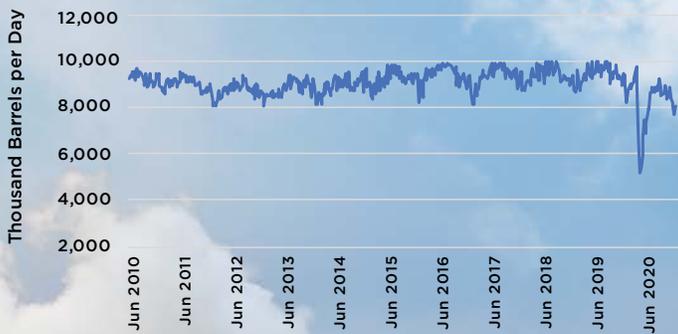


**WEEKLY U.S. ETHANOL INDUSTRY CAPACITY UTILIZATION**



Source: U.S. Energy Information Administration

**WEEKLY PRODUCT SUPPLIED OF FINISHED MOTOR GASOLINE**



Source: U.S. Energy Information Administration

“The threat of climate change is a present and growing danger, and we must promote sustainable agriculture solutions that are economically viable, ecologically just, and support the social fabric of our rural communities. Transitioning away from fossil fuels toward ethanol and biofuels can create jobs and foster economic opportunities in our rural communities.”

– U.S. Rep. David Scott (D-GA), Chairman of the House Agriculture Committee



# ESSENTIAL FOR THE ECONOMY

While the COVID-19 pandemic significantly reduced ethanol production in 2020, the industry remains a major driver fueling the rural economy. Ethanol biorefineries continue to offer skilled jobs and good wages in rural communities where attractive employment opportunities are often hard to find. And the industry continues to serve as an essential cog in the agriculture sector's economic engine, generating tens of billions of dollars in economic activity.

In 2020, more than 62,000 U.S. jobs were directly associated with the ethanol industry, which supported an additional 242,600 indirect and induced jobs across all sectors of the economy. The industry created \$18.6 billion in household income and contributed \$34.7 billion to the national Gross Domestic Product (GDP). Moreover, the ethanol industry spent \$21.4 billion on raw materials, inputs, and other goods and services.

The demographic breakdown of the renewable fuels workforce is significant, employing a higher percentage of female, older and unionized workers than the petroleum industry. In addition, one out of five ethanol workers are veterans of the U.S. military; veterans comprise only 6% of the national workforce.

With COVID-19 vaccinations now underway, and as the economy rebounds, the outlook for 2021 is growing clearer: We expect to see the industry's economic impact and reach recover and pick up where we left off in 2019.

## Ethanol's Value-Added Proposition

Based on average prices and product yields in 2020, a typical dry mill ethanol plant was adding approximately \$1.27 of additional value—or 37%—to every bushel of corn processed.

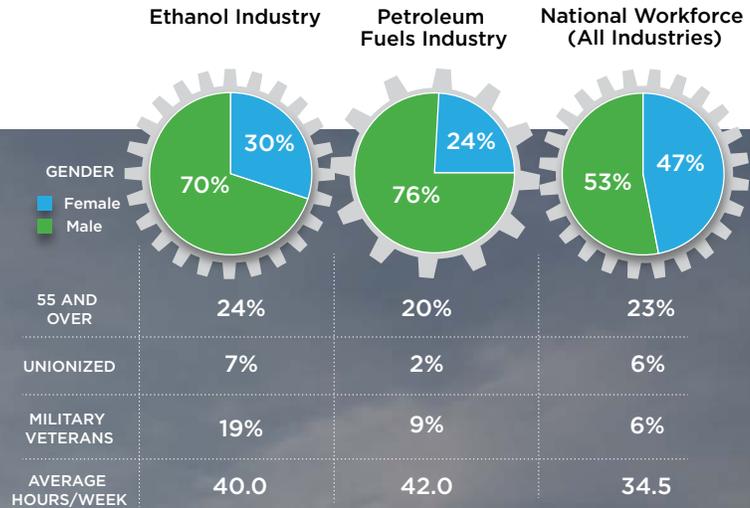
CORN COST PER BUSHEL  
**\$3.42**



VALUE OF OUTPUTS PER BUSHEL	
Ethanol.....	\$3.48
Distillers Grains.....	\$1.03
Corn Distillers Oil.....	\$0.18
<b>TOTAL</b>	<b>\$4.69</b>

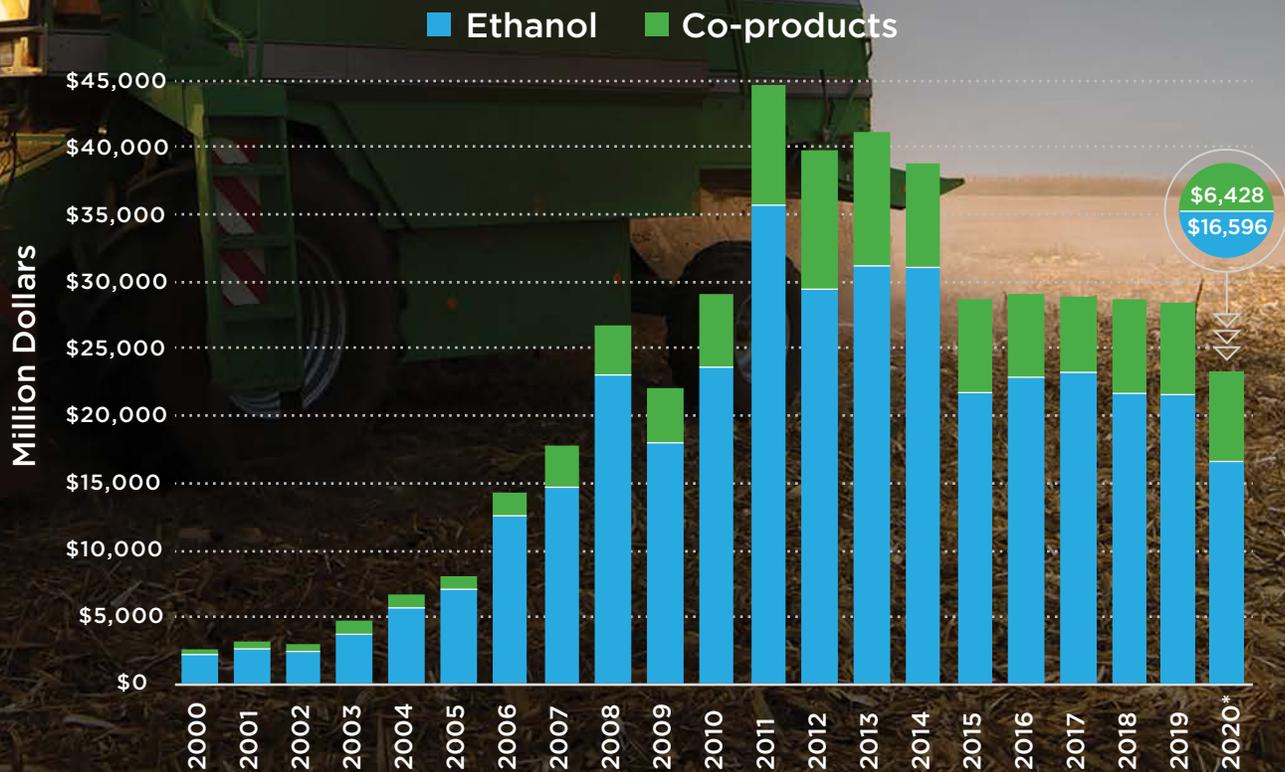
	2019	2020
Direct jobs	68,542	62,180
Indirect/Induced jobs	277,389	242,600
Household income	\$22.9 billion	\$18.6 billion
GDP contribution	\$42.8 billion	\$34.7 billion

# ETHANOL INDUSTRY WORKFORCE DEMOGRAPHICS



Sources: Energy Futures Initiative, National Association of State Energy Officials, U.S. Bureau of Labor Statistics

## GROSS VALUE OF U.S. ETHANOL INDUSTRY OUTPUT



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

# EXPANDING GLOBAL DEMAND

The United States remained the world leader in ethanol production in 2020, despite the pandemic-induced reduction in output. The U.S. saw its share of total global output decline slightly to 53 percent, but we remained responsible for more than half of worldwide production. Meanwhile, Brazil's share of total world production rose slightly to 31 percent.

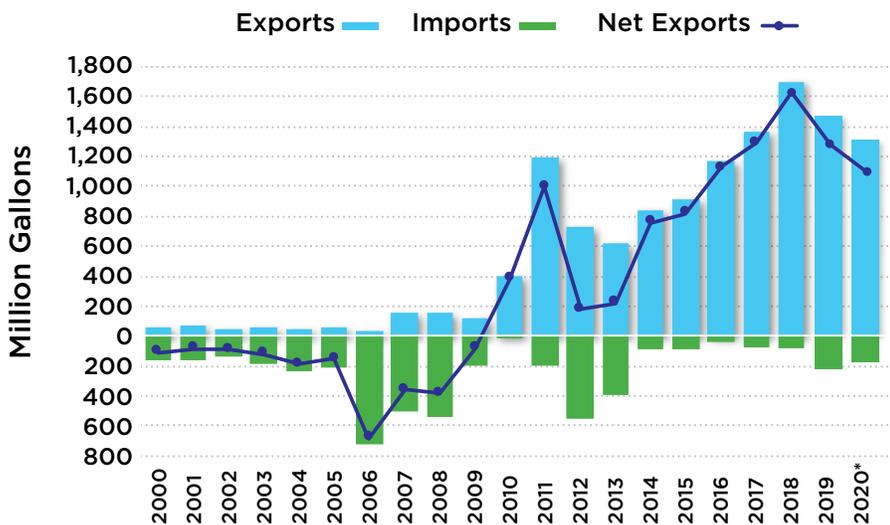
U.S. ethanol exports were buffeted by a combination of the impact of the global pandemic on fuel consumption and prices and by a further ratcheting up of trade restrictions. Exports fell 9 percent from 2019 to an estimated 1.3 billion gallons.

Canada regained its position as the top destination for U.S. ethanol, taking one-quarter of U.S. exports. However, exports to Brazil plunged more than 40 percent, as a result of the pandemic's impact on fuel consumption and on-again, off-again turmoil surrounding the country's tariff-rate quota. In December, Brazil let the tariff-free quota expire for good, resulting in a 20 percent tariff being assessed on all U.S. ethanol imports.

On the bright side, shipments to India increased approximately 15 percent, putting it roughly on par with Brazil as the second-largest destination for U.S. ethanol. Exports to Mexico doubled. The increased global demand for industrial alcohol also helped buoy overall U.S. exports, as manufacturing of sanitizers and disinfectants increased.

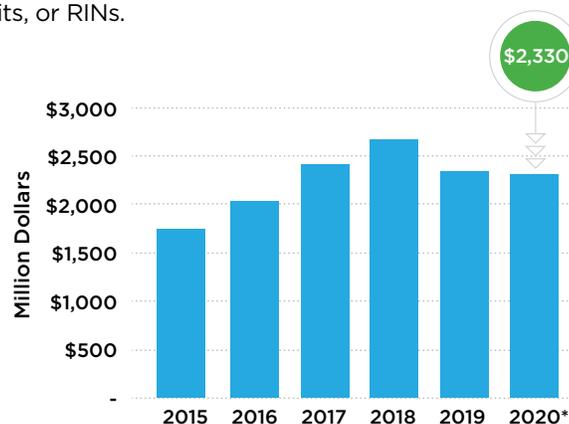
U.S. ethanol imports in 2020 were on par with 2019 levels, despite the cutback in U.S. fuel consumption. Virtually all fuel ethanol imports entered the country in California, where Brazilian sugarcane-based ethanol has benefitted from both the state's Low Carbon Fuel Standard and from premium values for "advanced biofuel" RFS credits, or RINs.

## U.S. ETHANOL EXPORTS AND IMPORTS



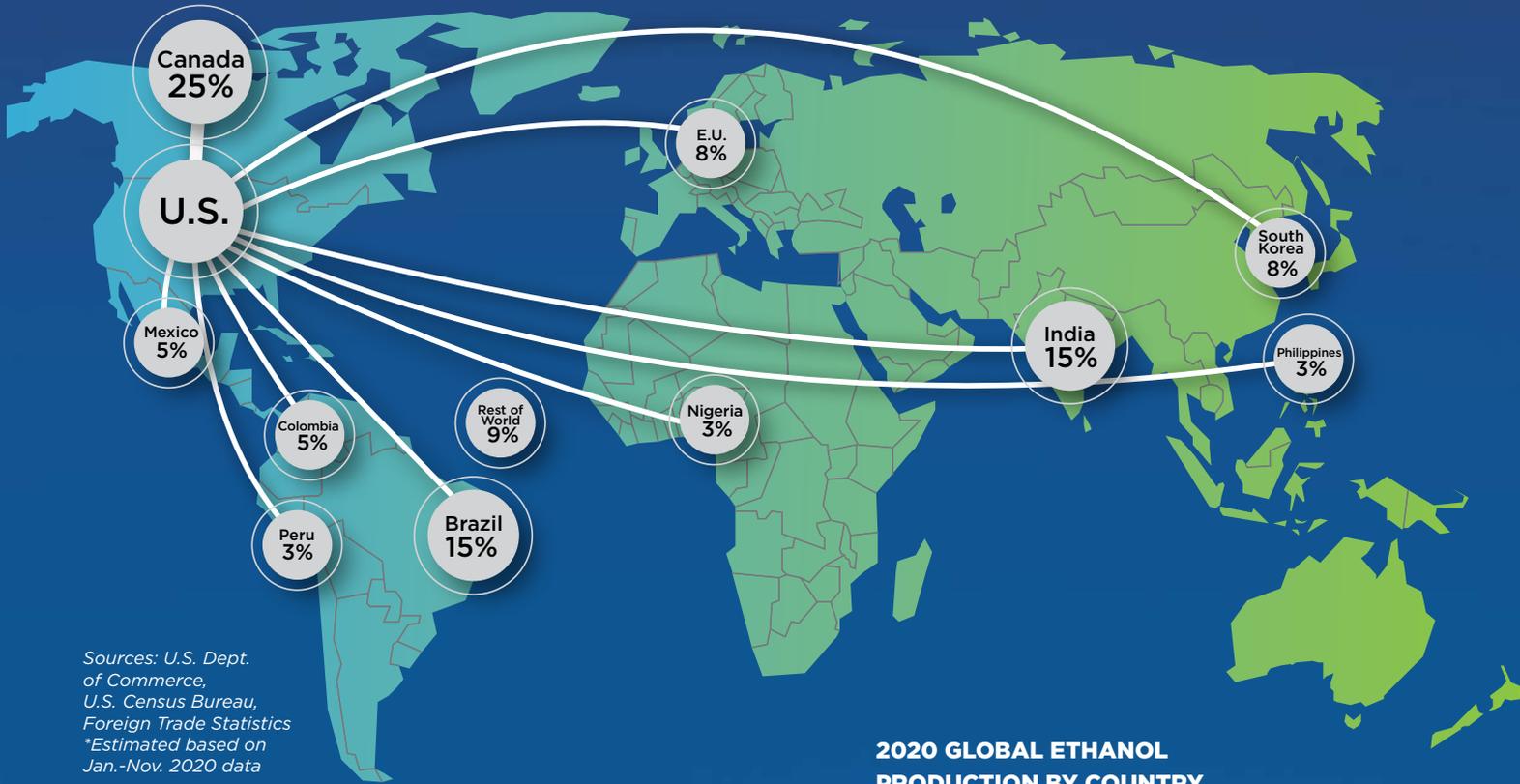
Sources: U.S. Dept. of Commerce, U.S. Census Bureau, Foreign Trade Statistics  
\*Estimated based on Jan.-Nov. 2020 data

## VALUE OF U.S. ETHANOL EXPORTS



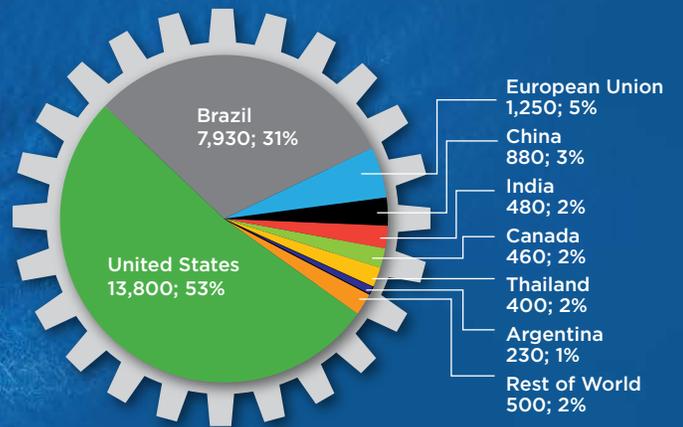
Sources: U.S. Dept. of Commerce, U.S. Census Bureau, Foreign Trade Statistics  
\*Estimated based on Jan.-Nov. 2020 data

# TOP DESTINATIONS FOR U.S. ETHANOL EXPORTS IN 2020



Sources: U.S. Dept. of Commerce, U.S. Census Bureau, Foreign Trade Statistics  
 \*Estimated based on Jan.-Nov. 2020 data

## 2020 GLOBAL ETHANOL PRODUCTION BY COUNTRY (Country, million gallons, share of global production)



Global ethanol production fell to 26 billion gallons in 2020 as a result of the coronavirus pandemic. The United States remained the largest producer, accounting for over half of global output.

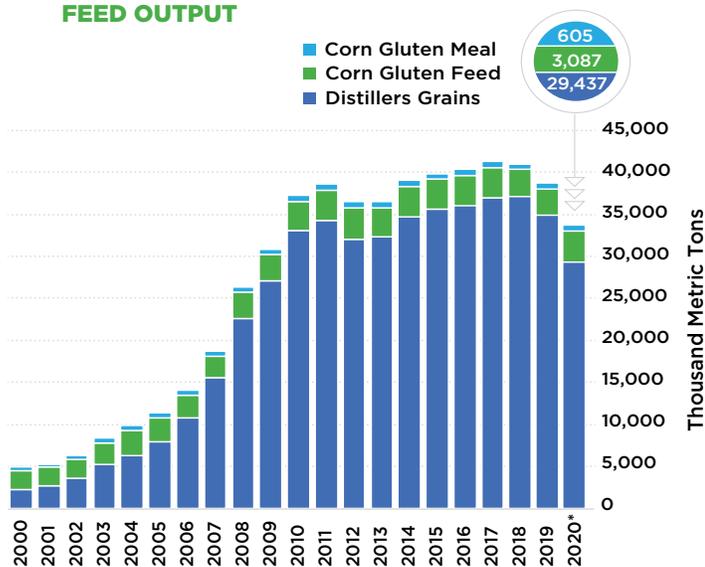
Source: RFA analysis of public and private data sources

# COPRODUCTS ON THE RISE

If there was a silver lining to the COVID-19 pandemic for U.S. ethanol producers, it was that the pandemic brought focus to the fact that the industry makes more than renewable fuel—a lot more.

One of the industry's essential coproducts that typically flies below the radar, biogenic carbon dioxide, got lots of attention in 2020. CO<sub>2</sub> is captured by about a quarter of our nation's ethanol plants and is used for everything from beverage carbonation and meat processing to wastewater treatment and dry ice production. At full capacity, ethanol plants capture 3 to 3.5 million tons of CO<sub>2</sub> annually, or roughly 40 percent of the national supply. With the pandemic came fears that CO<sub>2</sub> needs would not be met. And while production did slip in 2020, the industry continued to be a leading supplier. U.S. ethanol producers captured 2.3 million tons of high-grade biogenic CO<sub>2</sub> for North American food/beverage and industrial markets.

## U.S. ETHANOL INDUSTRY COPRODUCT ANIMAL FEED OUTPUT

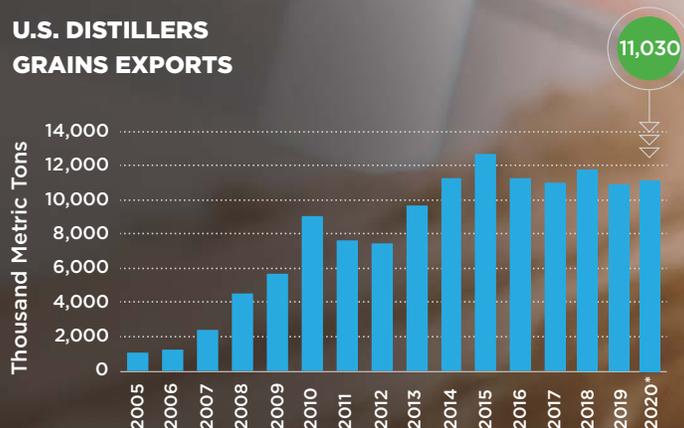


Source: RFA and U.S. Dept. of Agriculture. Note: All co-products converted to 10% moisture basis \*Estimated

## Ethanol's Livestock Connection

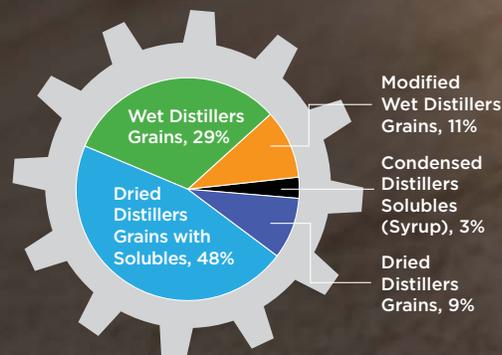
In 2020, U.S. ethanol producers generated 33.1 million metric tons (mmt) of distillers grains, gluten feed, and gluten meal. These bioproducts are valuable protein-rich substitutes for corn, soybean meal, and other ingredients used to feed beef and dairy cows, pigs, chickens, turkeys, fish, and other animals around the world. In addition, biorefineries extracted 3.3 billion pounds of corn distillers oil, a \$940 million market underpinning the production of biodiesel and animal feed.

## U.S. DISTILLERS GRAINS EXPORTS



Sources: U.S. Dept. of Commerce, U.S. Census Bureau, Foreign Trade Statistics \*2020 estimated based on Jan.-Nov. 2020

## DISTILLERS GRAINS PRODUCTION BY TYPE

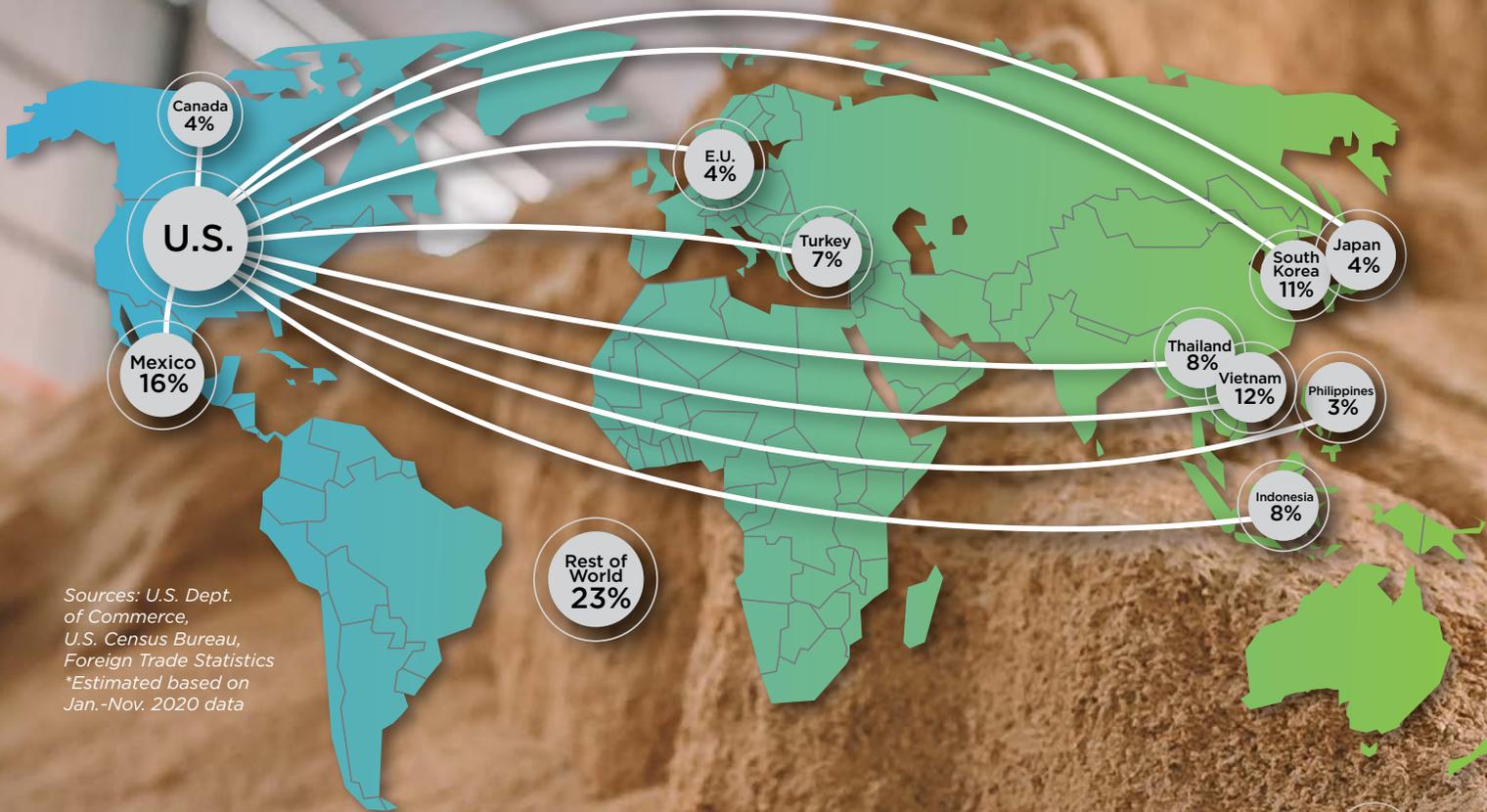


Source: U.S. Dept. of Agriculture and RFA

## A DIVERSIFIED TRADE PORTFOLIO

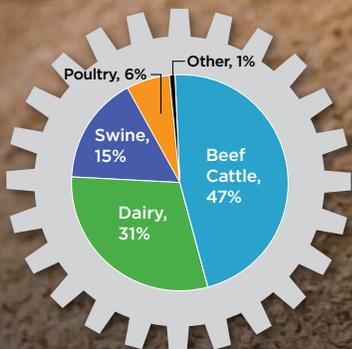
U.S. biorefineries satisfied growing domestic animal food needs while also exporting about a third of distillers grains produced. In 2020, more than 50 countries purchased a cumulative 11 mmt of U.S. distillers grains. Half of these exports landed in Southeast and East Asia. Meanwhile nearly 20 percent of total exports were shipped to Mexico, as the country extended its position as our top distillers grains customer for a fourth consecutive year.

## TOP DESTINATIONS FOR U.S. DISTILLERS GRAINS EXPORTS IN 2020



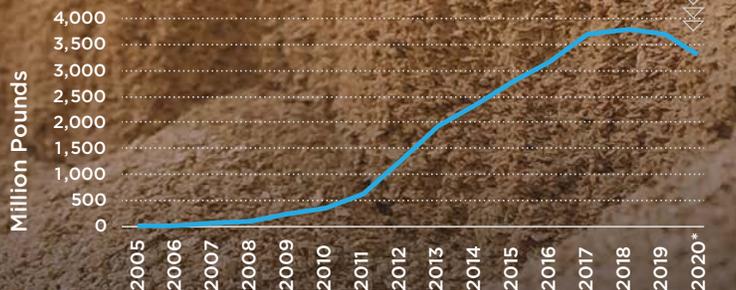
Sources: U.S. Dept. of Commerce, U.S. Census Bureau, Foreign Trade Statistics  
\*Estimated based on Jan.-Nov. 2020 data

## DISTILLERS GRAINS CONSUMPTION BY SPECIES



Source: Distillers grains marketing companies

## CORN DISTILLERS OIL PRODUCTION



Sources: U.S. Dept. of Agriculture and RFA \*Estimated

# THE PANDEMIC PIVOT

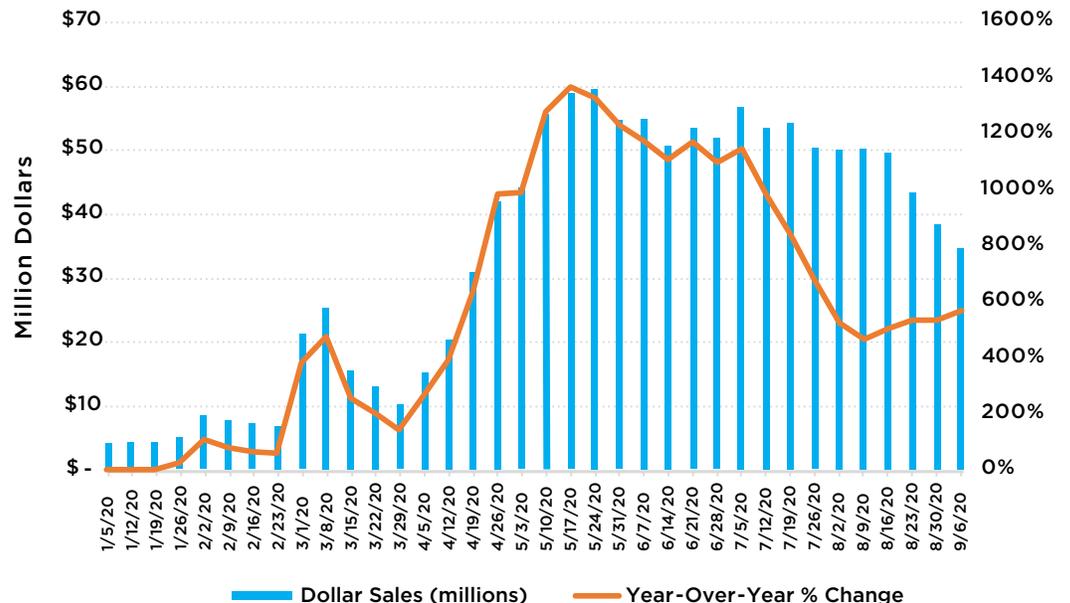
The spread of COVID-19 early in 2020 upended the ethanol industry in ways that were previously unimaginable. At the peak of the crisis, in late April, more than half of ethanol capacity was idled and less than a quarter of the nation's biorefineries were running at full capacity.

At the same time, we saw the industry take on a new look as unforeseen challenges and opportunities arose, and new partnerships formed. Our nation's ethanol producers rose to the occasion, and we saluted our members for their community leadership. Perhaps the greatest story for the year was how ethanol producers around the country pivoted to produce more high-purity alcohol for hand sanitizers and other disinfectants.

Moving forward into 2021, we know a little of what to expect: A slow and gradual return to whatever "normal" will mean, punctuated with the threat of new surges or other problems down the line. While we don't expect fuel ethanol production to reach pre-pandemic normal quickly, we do expect the increased demand for high-purity alcohol for sanitizers to continue well into 2021.



## RETAIL HAND SANITIZER SALES, REPORTED WEEKLY



Source: Information Resources, Inc.



**AEMETIS**  
HAND SANITIZER

Gallo is honored to play a small role in helping our community. To our colleagues working tirelessly on the production lines and in our distribution, along with our sales & operations teams keeping stores supplied and stockshilled, we appreciate you! In return, we appreciate you!

E&E Gallo Winery  
Not for Consumption

# EVOLVING POLICY

**W**ith a new Congress and new administration settling in, Washington will undoubtedly have a different look and feel in 2021. Throughout his campaign, President Joe Biden signaled that addressing climate change will be a priority, and he promised to push policies that move the country toward achieving net-zero carbon emissions from the power sector by 2035, and economy-wide by 2050.

But Congress may have other ideas. A severely diminished Democratic majority in the U.S. House of Representatives and a narrowly divided Senate present a challenging federal landscape that the Biden administration team will need to navigate. Attempting to

take action without Congress may be in the cards for our new president, as a key trend of the modern presidency has been the increased use of executive orders.

The new administration is likely to focus on rolling back many of President Trump's actions on energy and climate, replacing them with new, ambitious orders focused on reducing greenhouse gas emissions with an emphasis on "environmental justice." Other top priorities, including the economy and healthcare, are likely to take precedence over sweeping legislative action to combat climate change.

## KEY CABINET MEMBERS



### USDA Secretary Tom Vilsack

- U.S. Dairy Export Council president and CEO, 2017-2020
- USDA secretary, 2009-2017
- Iowa governor, 1999-2007
- Strong supporter of ethanol and other renewable fuels



### EPA Administrator Michael Regan

- NC Department of Environmental Quality secretary, 2017-2020
- Environmental Defense Fund, various roles, 2012-2016
- EPA staff on air quality and energy issues, 1998-2008



### Energy Secretary Jennifer Granholm

- Michigan governor, 2003-2011
- Has previously supported renewable fuels
- Deeply knowledgeable about auto industry

RFA'S FOCUS: FIVE POLICY AND REGULATORY SOLUTIONS FOR 2021 AND BEYOND

“The Renewable Fuel Standard marks our bond with our farmers and our commitment to a thriving rural economy. ... A Biden-Harris Administration will promote and advance renewable energy, ethanol, and other biofuels to help rural America and our nation’s farmers, and will honor the critical role the renewable fuel industry plays in supporting the rural economy and the leadership role American agriculture will play in our fight against climate change.”

– Presidential candidate Joe Biden, August 2020



**Maximize the Low Carbon Benefits of the Renewable Fuel Standard (RFS).**

EPA’s failed implementation of the RFS under the Trump administration resulted in numerous missed opportunities for immediate greenhouse gas reductions, lower fuel prices, and decreased petroleum imports.



**Build Upon the RFS with New Low Carbon, High Octane Fuel Policies.**

While the RFS has created a durable policy foundation for reducing GHG emissions from the transportation sector, complementary policies could deepen and accelerate the decarbonization of our nation’s transportation fuels.



**Optimize Vehicle Technologies for Low Carbon, High Octane Fuels.**

Because fuels and vehicles operate as integrated systems, policy and regulation designed to increase the consumption of more efficient low carbon liquid fuels must be accompanied by policies that compel or incentivize the production and purchase of vehicles capable of operating on those fuels.



**Modernize our Nation’s Transportation Fuel Infrastructure.**

Rapid proliferation of low carbon liquid fuels will require modest improvements to our nation’s fuel infrastructure.



**Renew and Reset Trade Relationships in Key International Ethanol Markets.**

Despite aggressive efforts by the U.S. ethanol industry to expand international market access, trade disputes with several key markets for ethanol have severely hamstrung U.S. export volumes. Resetting trade relationships with China, Brazil, Mexico and Colombia would help remove new barriers and drive a return to free and fair trade with these countries and others.

# THE GOLD STANDARDS: RFS & LCFS

Since its inception in 2005, the Renewable Fuel Standard has been a crucial driving force for creating marketplace opportunities for ethanol and other renewable fuels. While implementation of the statute by the U.S. Environmental Protection Agency has been inconsistent at best, the RFS has still provided the foundation upon which U.S. ethanol producers have built an Essential Energy industry. That's why RFA continues to protect and defend the RFS from the oil industry's endless attacks.

In January 2020, the U.S. Court of Appeals for the Tenth Circuit ruled in *RFA et al. v. EPA* that the agency had far exceeded its statutory authority in granting RFS compliance waivers to oil refineries that were ineligible to receive them under the law. Joining RFA in the challenge were the National Corn Growers Association, the National Farmers Union, and the American Coalition for Ethanol. The decision set an important precedent that should eliminate the rampant abuse of the small refinery exemption program moving forward.

Indeed, we anticipate future implementation of the RFS will be more consistent with the statute and will provide the ethanol industry with the demand certainty intended by Congress.

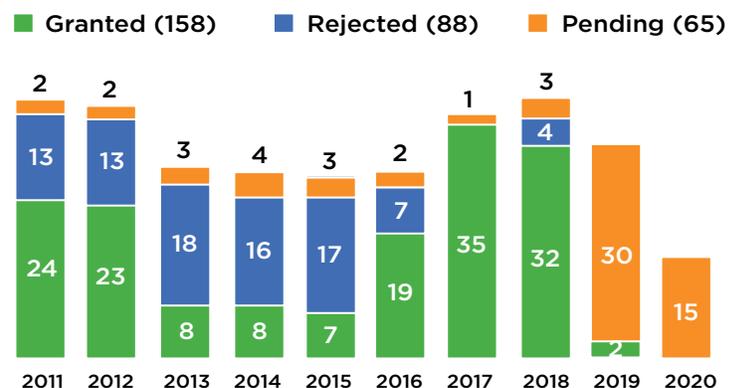
Beyond creating new market opportunities for farmers, reducing our dependence on imported oil, and lowering the cost of fuel to the consumer, the RFS has also served as the only federal legislation requiring greenhouse gas emissions reductions from the motor fuels sector. But with growing interest in reducing carbon emissions, many are contemplating how best to build upon the success of the RFS by exploring policies such as a Low Carbon Fuel Standard (LCFS) or a High Octane, Low Carbon (HOLC) fuel program.

The LCFS policy model already has a decade of success in California, where ethanol has provided more than 40 percent of the carbon reductions achieved under the program thus far. RFA has embraced the idea of a national LCFS that works in conjunction with the RFS, not as a substitute for it.

Meanwhile, RFA enthusiastically welcomed the introduction of the Next Generation Fuels Act in late 2020 by Rep. Cheri Bustos (D-IL). The bill would require an orderly transition to high octane (98 RON) low carbon fuels that would enable greater fuel efficiency and lower emissions. The RFA anticipates this effort to gain momentum in 2021.

The RFS has provided a sound foundation and a nationwide LCFS or HOLC program could add substantially to that success. For years to come, ethanol will be critical to future climate strategies, making it truly an Essential Energy.

## SMALL REFINERY EXEMPTIONS



Source: EPA, as of 1/21/21

REFS

“For the last three and a half years, we have been forced to fight battle after battle...to ensure our country is meeting the full potential of biofuels. The *Next Generation Fuels Act* looks toward the future to make sure we bring an environmental lens to biofuels production, in order to increase demand while reducing carbon emissions.”

- Rep. Cheri Bustos, D-IL

# NEXT GENERATION FUELS ACT

## KEY PROVISIONS:

- Requires EPA to allow automakers to use a new 98 Research Octane Number (RON) fuel to certify new vehicles for emissions and fuel economy, making 98 RON fuel available no later than January 1, 2022.
- Requires octane sources used in the new 98 RON fuel to result in at least 30 percent fewer greenhouse gas emissions than unblended gasoline, reducing emissions by at least 11 percent compared to current regular gasoline. Establishes a clean octane standard by limiting the aromatic hydrocarbon content of gasoline to an annual average of 17.5 percent by volume.
- Removes unnecessary and outdated regulatory barriers preventing more high octane, low carbon blends from entering the market by ensuring all ethanol blends greater than 10 percent receive the same Reid Vapor Pressure treatment as 10 percent and 15 percent blends.
- Requires automakers, beginning with the 2024 model year, to warrant vehicles for use on 98 RON fuel and ethanol blends up to and including 30 percent.

ICES

# ESSENTIAL FOR CUTTING CARBON

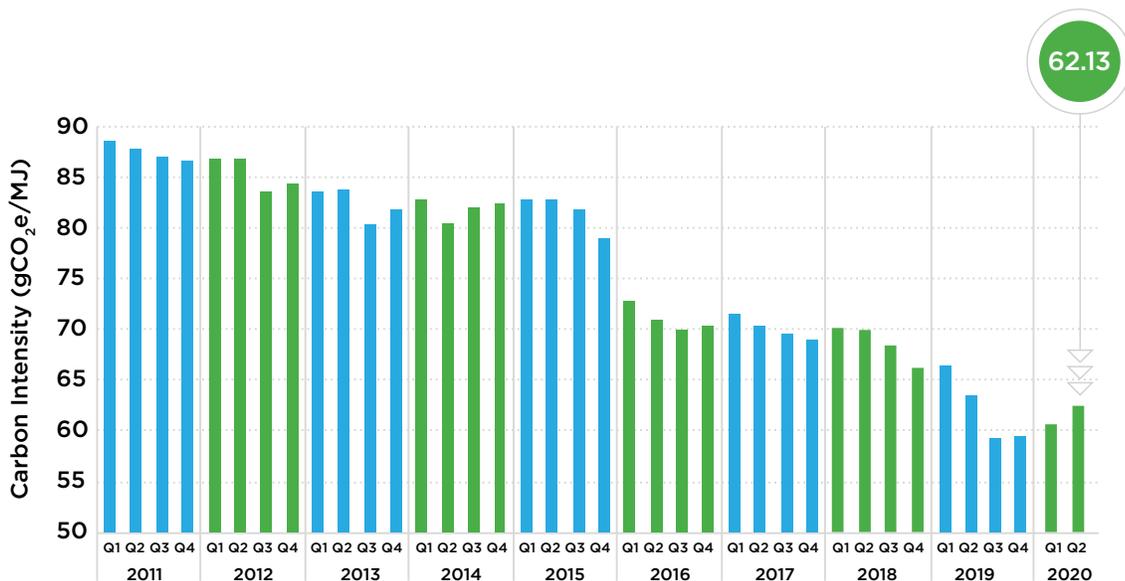
The rise of global temperatures and cataclysmic natural disasters and weather events, from droughts to floods to wildfires, have hastened and intensified policy discussions around carbon's role in climate change. Everyone is looking for answers and for decades, renewable fuels like ethanol have been part of the solution. State and federal agencies agree that grain-based ethanol cuts greenhouse gas emissions significantly—by 35 to 50 percent compared to gasoline. Emerging technologies promise to boost that reduction to around 70 percent in just the next few years, according to USDA. And ethanol made from corn kernel fiber and other cellulosic feedstocks is already delivering reductions of 80 percent or more.

With ethanol, we don't have to wait and hope for major technological or economic breakthroughs; the fuel is available now at a low cost to drive decarbonization of our liquid fuels.

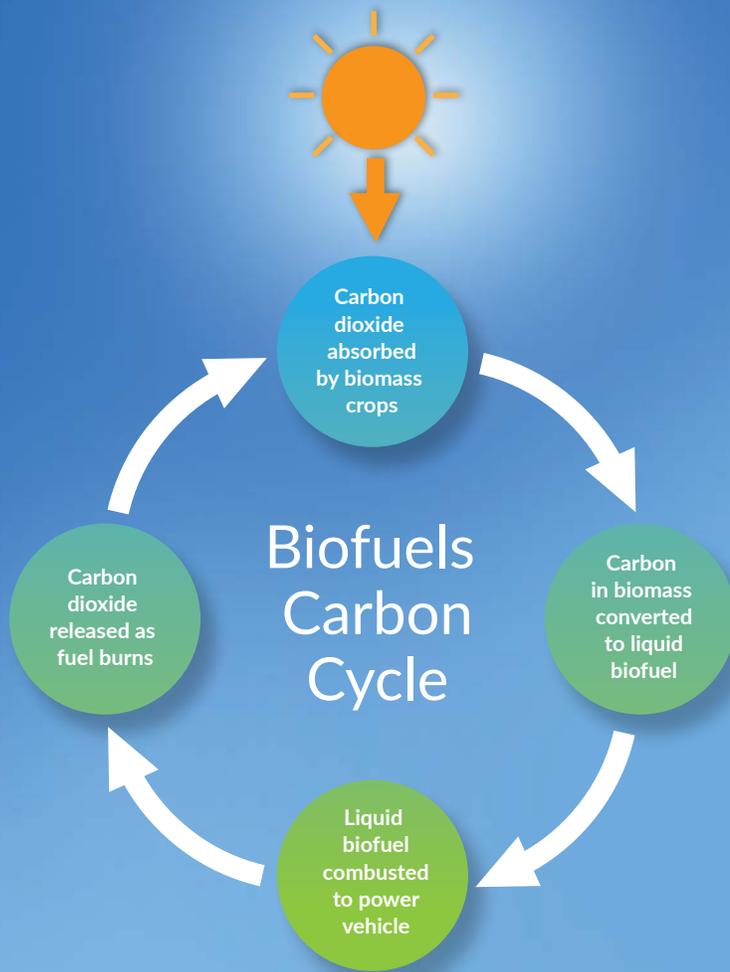
How does this work? Plants that are ultimately made into renewable fuels absorb carbon dioxide from the atmosphere as they grow, and that same amount of carbon dioxide is re-released when the fuel is produced and combusted in an engine. In this way, ethanol and other renewables simply recycle atmospheric carbon. Even when the energy use and emissions related to the full production process are accounted for, ethanol delivers significant GHG savings compared to the fossil fuels it replaces.

Further, by displacing hydrocarbon substances like aromatics in gasoline, ethanol helps reduce emissions of air toxics, along with particulate matter, carbon monoxide, nitrogen oxides and exhaust hydrocarbons. These pollutants cause smog and ground-level ozone and adversely affect human health. Cutting these emissions results in lower incidence of respiratory illness and asthma, heart disease, lung disease and cancer—and ultimately fewer premature deaths.

## CARBON INTENSITY OF STARCH-BASED ETHANOL IN CALIFORNIA GASOLINE



Source: RFA using California Air Resources Board data



## New Studies Track Significant GHG Emissions Reductions

Research from Environmental Health & Engineering Inc., released in late January, shows that greenhouse gas emissions for ethanol are 32 percent to 62 percent lower than gasoline, with a central best estimate of 46 percent.

- The research, by scientists affiliated with Harvard and Tufts universities in Massachusetts, delivers a transparent, state-of-the-science assessment on lifecycle analyses of corn starch ethanol in the United States.
- The study credits recent efficiency improvements and the adoption of new technologies for the steady reduction in the lifecycle carbon intensity of corn ethanol.
- Importantly, EH&E's assessment also shows that carbon emissions from converting prior land uses to corn farming make up only 7 percent of the biofuel's total GHG emissions—a much smaller amount than generally recognized.

**THE USE OF ETHANOL IN GASOLINE IN 2020 REDUCED CO<sub>2</sub>-EQUIVALENT GREENHOUSE GAS EMISSIONS FROM THE TRANSPORTATION SECTOR BY 47.3 MILLION METRIC TONS. THAT'S EQUIVALENT TO REMOVING 10.1 MILLION CARS FROM THE ROAD FOR AN ENTIRE YEAR, OR ELIMINATING THE ANNUAL EMISSIONS FROM 12 COAL-FIRED POWER PLANTS.**

*Source: RFA analysis using U.S. Dept. of Energy GREET model*

Also in January, a study by Life Cycle Associates confirmed that the Renewable Fuel Standard has resulted in aggregate GHG reductions from the use of biofuels that exceed the EPA's original projections. The RFS, as expanded in 2007, has resulted in cumulative CO<sub>2</sub> savings of 980 million metric tons. This is due to the greater-than-expected savings from corn-based ethanol and other biofuels and occurs even though cellulosic biofuels have not met legislative targets. In addition, LCA research indicates GHG emissions from petroleum are higher than the EPA baseline.

# ABOVE AND BEYOND E10

One refreshingly bright spot in the ethanol market in 2020 was that, despite the pandemic-induced reduction in fuel demand, market opportunities for E15 and flex fuels like E85 continued to grow.

The number of gasoline marketers and retailers offering E15 and E85 flex fuels increased steadily throughout the year. There are now more than 2,150 stations across the country offering E15 and nearly 5,050 offering E85 to consumers. That remarkable increase in E15 and flex fuel infrastructure was largely driven by USDA's Higher Blends Infrastructure Incentive Program, or HBIIP, which provides fuel retailers with the resources to empower real fuel choice.

RFA worked directly with hundreds of marketers and retailers to encourage participation in this important program and expand ethanol market opportunities. Every applicant RFA helped through the HBIIP process—three dozen companies with stations in 128 cities across 22 states—was successful in securing grant funding!

Moreover, virtually all automakers now explicitly approve the use of E15, and future growth opportunities for the fuel appear almost limitless. BMW and Mini vehicles even go a step further, as the manufacturer continues to approve the use of E25 blends in all models.

Ironically, as the infrastructure for E85 and other flex fuels continues to grow, the number of flex fuel vehicles being offered to consumers continues to fall. Only two automakers—Ford and General Motors—are offering FFVs in model year 2021, and just 11 models overall will be available, with four available only to fleet purchasers. That's down from more than 80 different models from eight manufacturers being available to consumers as recently as model year 2015. RFA continues to strongly advocate for more FFVs and fairness in how alternative fuel vehicles are incentivized under fuel economy and greenhouse gas regulations.

As we look to the future and the need to address global climate change in a more meaningful way, the need for vehicles and infrastructure accommodating higher level ethanol blends will only increase. RFA will continue to lead the way to assure that state and federal policies allow higher ethanol blends to lead the fight to reduce carbon emissions, lower fuel prices, and provide more options at the pump for consumers.



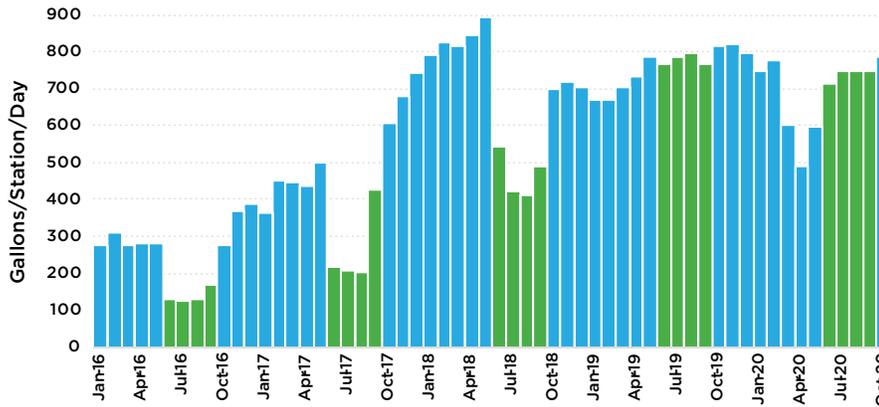
## THE FOLLOWING MODEL YEAR 2021 VEHICLES ARE AVAILABLE AS FLEX FUEL VEHICLES (FFVs):

- Ford Explorer 3.3L
- Ford Police Interceptor Utility 3.3L
- Ford F150 3.3L
- Ford F150 5.0L
- Ford Super Duty (F250, F350) 6.2L
- Ford Transit 3.5L

### FLEET ONLY:

- Chevrolet Silverado 5.3L
- Chevrolet Silverado HD 6.6L
- GMC Sierra 5.3L
- GMC Sierra HD 6.6L

## MINNESOTA AVERAGE E15 SALES



Source: RFA based on Minnesota Dept. of Commerce data

## E15 APPROVAL STATUS FOR CONVENTIONAL LIGHT-DUTY VEHICLES

- E15 Approved by Automaker in ALL Models
- E15 Approved by Automaker in SOME Models
- E15 Approved by EPA only; NOT Approved by Automaker

MODEL YEAR :	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Market Share*
<b>BMW Group**</b>											
BMW											1.9%
Mini											0.2%
<b>Daimler Group (Mercedes-Benz)</b>											
FCA (Chrysler, Dodge, Fiat, Jeep, RAM)											2.3%
Ford Motor Co. (Ford, Lincoln)											14.5%
GM (Buick, Cadillac, Chevrolet, GMC)											17.3%
Honda Motor Co. (Honda, Acura)											9.5%
Hyundai Motor Co. (Hyundai, Kia)											8.3%
<b>Mazda</b>											
<b>Mitsubishi Motors Corp.</b>											
<b>Nissan Motor Co.</b>											
Infiniti											0.6%
Nissan†											6.1%
Subaru‡											4.2%
Tata Motors (Jaguar, Land Rover)											0.7%
<b>Toyota Motor Corp.</b>											
Lexus											1.9%
Toyota											12.3%
<b>Volkswagen Group</b>											
Audi											1.3%
Porsche											0.4%
Volkswagen											2.2%
<b>Volvo Car Group</b>											
All Others											0.2%

\* Internal combustion engine (ICE) models only

\*\* Approves the use of up to 25% ethanol blends

† Approves the use of E15 in Rogue/Rogue Sport, Altima, Maxima, Versa & Titan. Approves the use of E10 in GT-R & NV Passenger/Cargo. Manuals not available to-date: Armada, Frontier, Murano, Pathfinder, Sentra & Z Coupe.

‡ Approves the use of E15 in Outback, Legacy, Impreza, Ascent & Crosstrek (2.0L engine). Approves the use of E10 in Forester & Crosstrek (2.5L engine). Manuals not available to-date: WRX/WRX STI & BRZ.

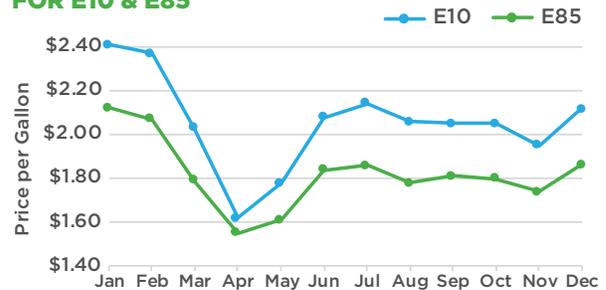
Sources: Auto manufacturer owner's manuals, GoodCarBadCar.net

## EXPANSION OF U.S. RETAIL STATIONS OFFERING E15 AND E85



Source: RFA

## 2020 NATIONAL AVERAGE RETAIL PRICES FOR E10 & E85



Source: RFA based on data from E85prices.com

# THE POWER OF OCTANE

The need for ethanol as a clean, affordable source of octane became even more apparent in 2020, as the pandemic hit U.S. and global fuel markets. While the price of regular unleaded gasoline fell, the price of premium gasoline remained elevated, particularly at the retail level. As a result, the price spread between premium and regular grades of gasoline spiked to the highest level in at least 25 years.

Ethanol's blending octane rating of 114 AKI is significantly higher than the ratings of the competing petroleum-based octane sources, the supplies of which have become constrained in recent years. Additionally, aromatic hydrocarbons like benzene are toxic and worsen air pollution.

Over the last 10 to 15 years, refiners have largely optimized their processes to reduce hydrocarbon-based octane production to take advantage of ethanol's properties. Today, most regular gasoline in the U.S. is produced using blendstock with an octane rating of 84, which is then upgraded to a rating of 87 by adding 10 percent ethanol. This allows refiners to increase throughput of hydrocarbon blendstock at lower cost. Higher blends like E15 and E30 offer an even greater octane boost when blended on top of today's regular gasoline.

Ethanol's octane boost provides a little fun in addition to improving the quality of our nation's fuel. The Tuatara, a flex fuel vehicle manufactured by SSC, became the fastest production car on the planet in 2020. It twice hit an average speed of 316 mph to claim the title. The engine boasts 1,750 horsepower when operating on high octane E85, and on one run it hit 331 mph, breaking the top speed of a Bugatti!

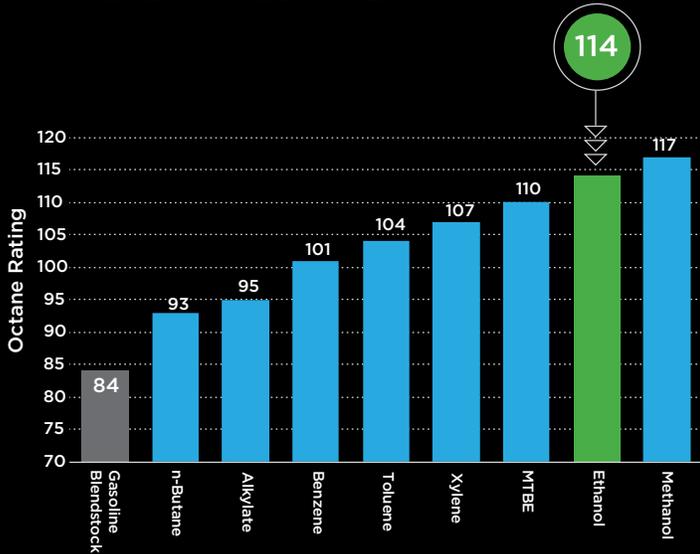


## WHAT IS OCTANE AND WHY IS IT IMPORTANT?

A fuel's **OCTANE RATING** is the measure of its ability to resist “knocking” in the engine, which is caused when the air/fuel mixture detonates prematurely during combustion. According to the U.S. 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.”

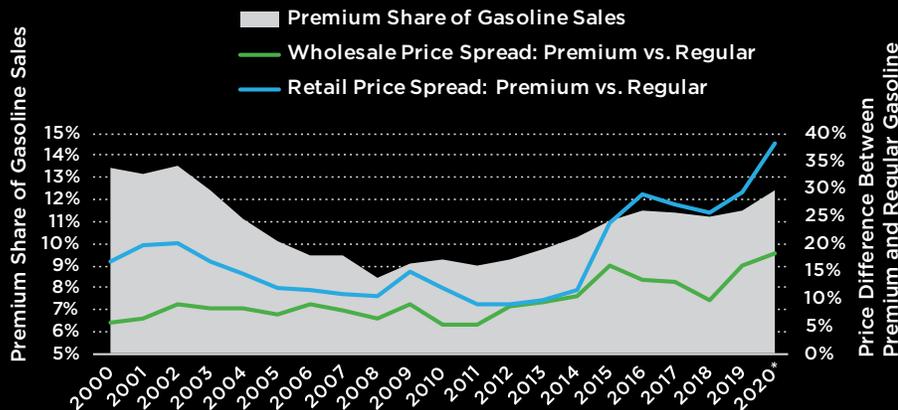


### BLENDING OCTANE RATINGS OF VARIOUS GASOLINE OCTANE BOOSTERS



Source: U.S. Department of Energy

### PREMIUM GASOLINE: SHARE OF SALES AND PRICE DIFFERENCE VS. REGULAR



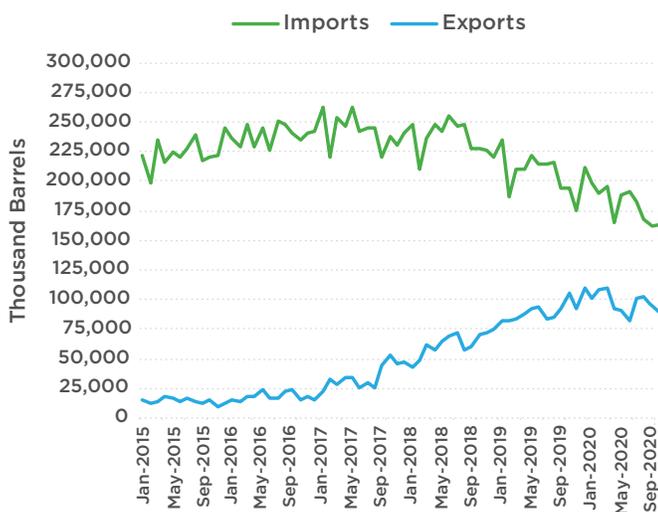
Source: Argus Media \* Based on Jan.-Aug. 2020 data

# ESSENTIAL FOR ENERGY SECURITY

In 2020, several events threatened the security and stability of U.S. energy markets. First came a “race-to-the-bottom” crude oil price war between Saudi Arabia and Russia. Then in April, government restrictions and other precautions related to the pandemic caused U.S. ethanol and gasoline consumption to be cut nearly in half. In response, WTI crude oil futures prices briefly turned negative for the first time in history.

Yet, over the course of the year, the U.S. remained a significant net importer of crude oil. Over 40 percent of the oil processed by U.S. refineries came from foreign sources in 2020. Notably, foreign crude oil has accounted for a steadily increasing share of the supply to refineries in California, the largest gasoline-consuming state over more than two decades.

## U.S. CRUDE OIL TRADE



**While U.S. crude oil production and exports have increased in recent years, our nation still imports more than 150 million barrels per month.**

Source: U.S. Dept. of Energy

If not for the role of ethanol in the nation’s fuel supply, the U.S. would have had to import nearly 500 million additional barrels of crude oil in 2020. Ethanol is produced at approximately 200 facilities concentrated in the U.S. Midwest—a secure source of fuel compared to the Middle East—and just 1 percent of the ethanol supply is imported. In short, ethanol is essential for energy security and, as 2020 showed, it provides resiliency in tumultuous times.



**Even though U.S. oil production has increased in recent years, our nation’s economy still transfers billions of dollars every year to the OPEC cartel. In 2020 alone, the U.S. sent some \$13 billion—or \$100 per American household—to OPEC nations to pay for crude oil imports.**

OPEC Nation	U.S. Spending on Crude Oil Imports (Billion \$)
Saudi Arabia .....	\$7.4
Iraq .....	\$3.1
Nigeria .....	\$1.2
Angola .....	\$0.5
Kuwait .....	\$0.4
Libya.....	\$0.2
Other OPEC .....	\$0.3
<b>TOTAL .....</b>	<b>\$13.0</b>

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

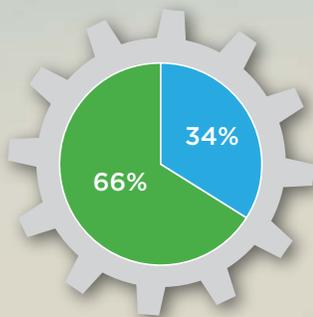
## HISTORIC OIL IMPORT DISPLACEMENT BY ETHANOL



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

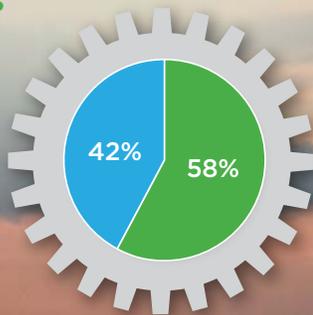
## SOURCES OF U.S. CRUDE OIL SUPPLY

- Domestic Production
- Imports



## INPUTS TO U.S. REFINERIES

- Domestic Inputs
- Imports



Source: RFA based on U.S. Dept. of Energy and forecasts



# FROM FIELD TO FUEL

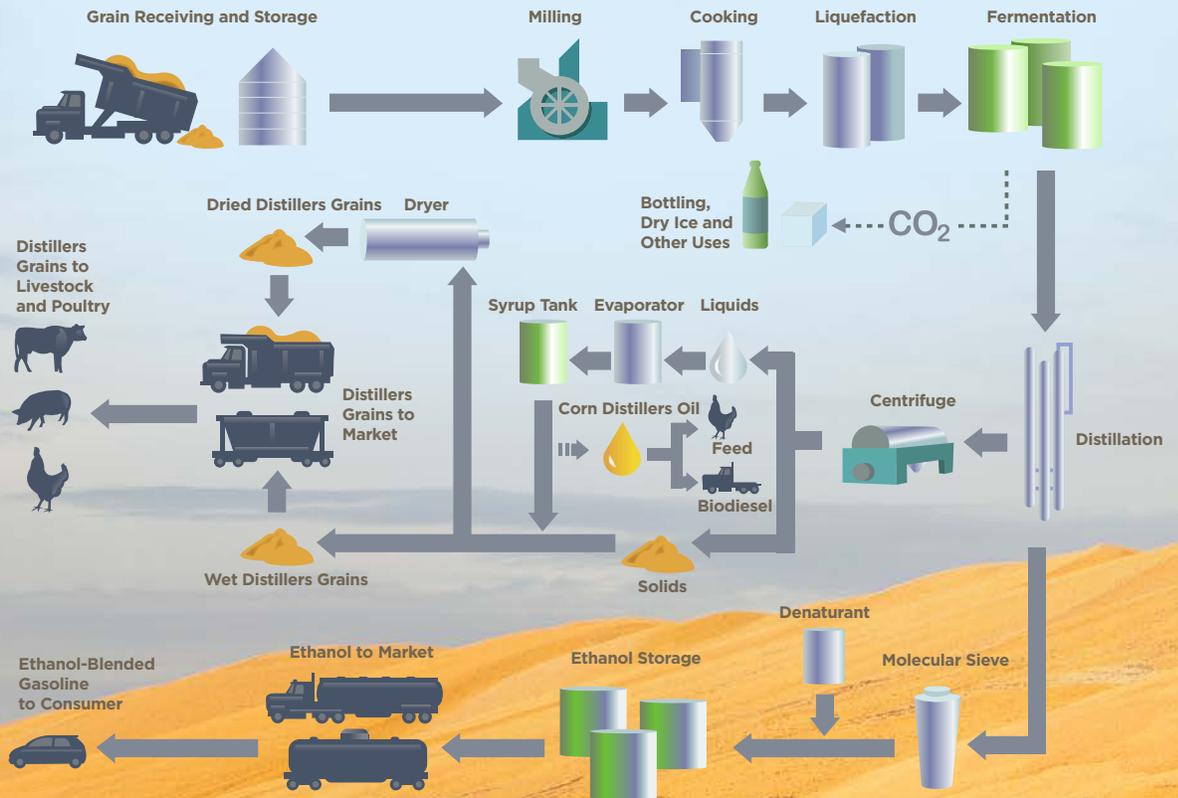
For generations, ethanol has helped farmers and others by adding value to corn at the same time as it saves drivers at the gas pump. Henry Ford and Alexander Graham Bell were among the first to recognize that the sugars found in plants could easily and inexpensively be converted into clean-burning renewable fuel. Bell himself referred to ethanol as a “clean, beautiful, and efficient fuel” more than a century ago.

Today’s industry uses state-of-the-art technologies to produce ethanol and valuable coproducts from the starches and sugars found in grains, beverage and food waste, and cellulosic biomass. American farmers themselves are often actively involved in many of these ethanol plants through ownership or leadership roles.

Roughly 90 percent of U.S. fuel ethanol is produced using the dry mill process, with the remaining amount coming from wet mills. The main difference between the two processes is in the initial treatment of the grain.

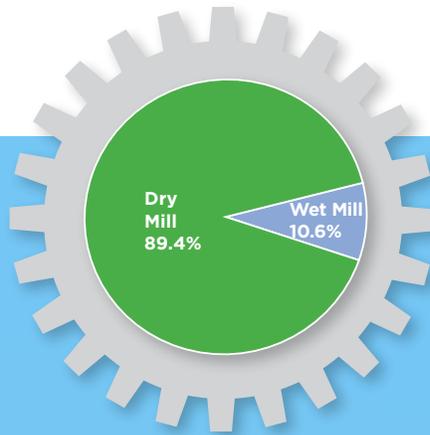
In **DRY MILLING**, the entire grain kernel is first ground into meal, then slurried with water to form a mash. Enzymes are added to the mash to convert starch to sugar. The mash is first cooked, then cooled and transferred to fermenters. Yeast is added and the conversion of sugar to alcohol begins. After fermentation, the resulting “beer” (not the kind you might drink) is separated from the remaining stillage. The ethanol is distilled and dehydrated, then blended with about 2 percent denaturant (such as gasoline) to render it undrinkable. It is then ready for shipment. The stillage is sent through a centrifuge that separates the solids from the solubles. These coproducts eventually become distillers grains and corn distillers oil.

## DRY MILL ETHANOL PROCESS



Source: RFA

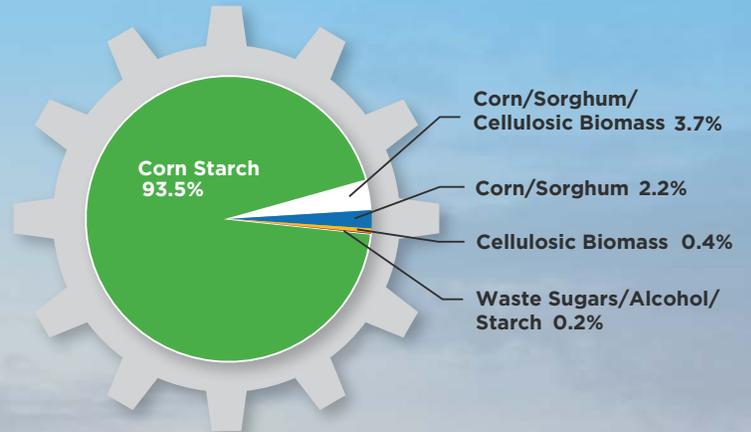
**U.S. ETHANOL PRODUCTION BY TECHNOLOGY TYPE**



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

In **WET MILLING**, the grain is first separated into its basic components through soaking. After steeping, the slurry is processed through grinders to separate the corn germ. The remaining fiber, gluten and starch components are further segregated. The gluten component (protein) is filtered and dried to produce animal feed. The remaining starch can then be fermented into ethanol, using a process like the dry mill process.

**U.S. ETHANOL PRODUCTION CAPACITY BY FEEDSTOCK TYPE**



Source: RFA

On average, 1 bushel of corn (56 pounds) processed by a dry mill ethanol biorefinery produces:

- 2.9 gallons of denatured fuel ethanol
- 15.2 pounds of distillers grains animal feed (10 percent moisture)
- 0.8 pounds of corn distillers oil
- 1.1 pounds of captured biogenic carbon dioxide

In 2020, ethanol biorefineries captured roughly 2.3 million tons of CO<sub>2</sub>, which was used for dry ice production, bottling, food processing, and other uses.

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



# ADVOCACY AND ENGAGEMENT

**W**hat does it take to be respected and effective in Washington? A strong technical foundation, intelligent messaging with a broad reach, and members and staff who are passionate and informed. Each year, the RFA testifies before Congress, takes part in regulatory hearings, addresses complex technical and scientific issues, educates consumers, argues in court, and speaks at countless national and international events. While some of this work was upended due to the pandemic, it did not stop us from finding new and different ways to accomplish RFA's mission.

Our annual Washington board meeting took place virtually in July, allowing for an all-digital round of Capitol Hill visits where our board got to hear from, and speak with, Sens. Chuck Grassley (R-IA), Deb Fischer (R-NE) and Dick Durbin (D-IL); House Reps. Cindy Axne (D-IA), Angie Craig (D-MN), Dusty Johnson (R-SD), Collin Peterson (D-MN), Adrian Smith (R-NE), Roger Marshall (R-KS), Rodney Davis (R-IL) and Cheri Bustos (D-IL). The event also included Ambassador Gregg Doud, chief agricultural negotiator at the Office of the U.S. Trade Representative; USDA Deputy Secretary Steve Censky; and Anne Idsal, principal deputy assistant administrator for the U.S. EPA.

Since 2009, RFA has co-sponsored the Iowa Science & Sustainability Tour, which brings federal policy-makers to Iowa for a hands-on experience with today's renewable fuels industry. Unfortunately, due to COVID-19, this year's tour was canceled so RFA replaced it with a Virtual Heartland Tour that attracted many congressional staff and other federal and state decisionmakers. The event included a series of educational videos on timely topics and Q&As with farmers, ethanol producers and one of the country's top fuel retailers.

Through RFA's various committees, our member companies direct the association's technical, safety, market research, and other priorities. And with regular interaction at RFA Board meetings and the National Ethanol Conference, RFA members stay abreast of the policy, marketing, and technology developments that affect their bottom line. If past is prologue, the coming months and years will bring dramatic change to ethanol policy and marketing. Count on the RFA and its membership to continue to lead the conversation, develop the technical underpinnings, and shape the message that will assure future growth.



## RFA COMMITTEES

Through RFA's various committees, our member companies direct the association's technical, safety, market research, and other priorities.

**The RFA Technical Committee** focuses on fuel specifications and standards development by ASTM International, National Conference on Weights and Measures, regulatory bodies, 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.

*Committee Chair Currently Open*

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

*Committee Chair: Matt Fitzthum, CHS Inc.*

**The RFA Environmental, Health and Safety 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. This committee also 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.

*Committee Chair: Steve Schleicher, Pinnacle Engineering Inc.*

**The RFA New Uses Committee** focuses on expanded uses for our ethanol, carbon dioxide, coproducts, and processes. Research and development projects like utilizing ethanol for use in medium- and heavy-duty engines or for producing electricity or carbon dioxide used to produce bio-based chemicals are explored. The committee will work to support R&D and technical and regulatory issues that arise for new uses.

*Committee Chair Currently Open*

**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.

*Committee Chair: Randy Doyal, AI-Corn Clean Fuel LLC*



# FUELING CONSUMER UNDERSTANDING

For 40 years, the Renewable Fuels Association has endeavored to improve consumer understanding about the value and importance of renewable fuels like ethanol. This work continued through 2020 and into 2021, even as the COVID-19 pandemic altered plans, canceled some events and forced others to a virtual format.

Fortunately for RFA, major lockdowns didn't begin until after signature events like February's National Ethanol Conference and Commodity Classic, both of which shined a spotlight on RFA's custom Flex Fuel E85 Jeep Wrangler, designed and built by Kenny Hauk and featured in his Amazon Prime series, *Hauk Machines*. Sporting more than 1,100 horsepower when fueled on E85, the Jeep serves as an incredible "conversation starter" about the performance, economic, and environmental benefits of using ethanol.

During the pandemic, while we faced far fewer opportunities for in-person outreach, RFA and the Jeep made it to the 2020 Sturgis Motorcycle Rally, where we sponsored the 13th annual Legends Ride and hosted "Free Fuel Happy Hours," providing a free tank of 93 octane E10 for nearly 1,000 motorcycles. Things looked a little different in Sturgis this past year, with face masks and hand sanitizer in abundance.

In fact, the sanitizer distribution at Sturgis and elsewhere allowed RFA to discuss the merits of ethanol even more. Southwest Iowa Renewable Energy, an RFA-member ethanol plant in Council Bluffs, Iowa, donated 1,000 bottles of its branded "SIREtizer" hand sanitizer to RFA for free distribution at events like the Rally.

RFA and the National Corn Growers Association again served as co-title sponsors for the Crappie Masters Tournament Trail in 2020, providing an effective venue for communicating ethanol's advantages to recreational boaters and anglers. At every tournament, the winners used E10 in their boats to bring home the trophy. The series included state-level tournament trails in Oklahoma, Kentucky, Missouri, Kansas, Iowa, Florida, Arkansas, Alabama, Tennessee and Louisiana.

RFA also continued to sponsor off-road racer Derek Tidd, who uses his E85-powered Can-Am X3 to share information about the use of E85 in off-road and racing engines. This racing season, Tidd Racing enjoyed four first place wins and seven Top-Five finishes. And RFA's custom E85 American Chopper, built by Paul Teutul Jr., continued to serve as a valuable outreach tool to demonstrate ethanol's benefits to motorcycle enthusiasts.



**"The UTV racing circuit continues to provide an excellent avenue for ethanol education and outreach. In fact, we are seeing the proof as more teams move to E85 each year."**

**- Derek Tidd, Tidd Racing**





**RFA MISSION:** Drive expanded demand for American-made renewable fuels and bioproducts worldwide.

**RFA VISION:** Help the world breathe easier with the power of renewable fuels.

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**RFF MISSION:** Meet the research and education needs of the U.S. fuel ethanol industry.

**RFF FOCUS:** Collaboration with academia, industry, and public policymakers on new uses, feedstocks, and technologies to promote a growing and sustainable renewable fuels industry.

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barchart.com/cmdty

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basf.com/global/en/products/  
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clearflameengines.com

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cte-global.com

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d3maxllc.com

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dsm.com

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ilcorn.org

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incorn.org/icmc

**Innospec Fuel Specialties LLC**  
innospec.com

**Iowa Corn Growers Association**  
iowacorn.org

**Iowa Renewable Fuels Association**  
iowarfa.org

**Kansas Corn Commission**  
kscorn.com/kcc

**Kansas Corn Growers Association**  
kscorn.com/kcga

**KATZEN International Inc.**  
katzen.com

**K•Coe Isom LLP**  
kcoe.com

**Kentucky Corn Growers Association**  
kycorn.org

**Kentucky Corn Promotion Council**  
kycorn.org/ky-corn-promotion-  
council

**Kurita America Inc.**  
kuritaamerica.com

**Lallemand Biofuels &  
Distilled Spirits**  
lallemandbds.com

**Leaf, by Lesaffre Advanced  
Fermentations**  
lesaffreadvancedfermentations.com

**Merjent Inc.**  
merjent.com

**Minnesota Bio-Fuels Association**  
mnbiofuels.org

**Minnesota Corn Growers  
Association**  
mncorn.org

**Minnesota Corn Research  
& Promotion Council**  
mncorn.org

**Missouri Corn Growers Association**  
mocorn.org

**Missouri Corn Merchandising  
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mocorn.org

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molemaster.com

**Murex LLC**  
murexltd.com

**NALCO Water, an Ecolab Co.**  
ecolab.com/nalco-water

**National Corn Growers Association**  
ncga.com

**National Corn-to-Ethanol  
Research Center**  
ethanolresearch.com

**Nebraska Corn Board**  
nebraskacorn.gov

**Nebraska Corn Growers  
Association**  
necga.org

**Nebraska Ethanol Board**  
ethanol.nebraska.gov

**Novozymes**  
novozymes.com/en/advance-  
your-business/bioenergy

**Ohio Corn Marketing Program**  
ohiocornandwheat.org

**Orion Oil LLC**  
orionoil.com

**Phibro Ethanol Performance Group**  
ethanolperformancegroup.com

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pineng.com

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wibiofuels.org

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coloradocorn.com/ccga

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distillersgrains.org

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iowafuellab.com

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marylandgrain.org

**Michigan Corn Growers Association**  
micorn.org

**National Sorghum Producers**  
sorghumgrowers.com

**New York Corn & Soybean Growers  
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nycornsoy.org

**North Dakota Corn Utilization  
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ndcorn.org/cornCouncil

**South Dakota Corn Growers  
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sdcorn.org

# 2021 U.S. ETHANOL PRODUCTION CAPACITY BY PLANT

Company	City	State	Feedstock	Production Capacity (mgy)	Capacity Under Construction/Expansion (mgy)
Absolute Energy LLC	St. Ansgar	IA	Corn	127	-
Ace Ethanol LLC	Stanley	WI	Corn/Cellulosic Biomass	54	-
Adkins Energy LLC	Lena	IL	Corn	60	-
Aemetis Inc.	Keyes	CA	Corn/Sorghum	60	-
AI-Corn Clean Fuel LLC	Claremont	MN	Corn	130	-
AltEn LLC	Mead	NE	Corn	25	-
Alto Ingredients Columbia Inc.	Boardman	OR	Corn	40	-
Alto Ingredients Madera Inc.	Madera	CA	Corn/Sorghum	40	-
Alto Ingredients Magic Valley Inc.	Burley	ID	Corn	60	-
Alto Ingredients Pekin ICP Inc.	Pekin	IL	Corn	90	-
Alto Ingredients Pekin Inc. (dry mill)	Pekin	IL	Corn	60	-
Alto Ingredients Pekin Inc. (wet mill)	Pekin	IL	Corn	100	-
Alto Ingredients Stockton Inc.	Stockton	CA	Corn/Sorghum/Cellulosic Biomass	60	-
Archer Daniels Midland Co. (dry mill)	Cedar Rapids	IA	Corn	300	-
Archer Daniels Midland Co. (wet mill)	Cedar Rapids	IA	Corn	240	-
Archer Daniels Midland Co.	Clinton	IA	Corn	237	-
Archer Daniels Midland Co. (dry mill)	Columbus	NE	Corn	313	-
Archer Daniels Midland Co. (wet mill)	Columbus	NE	Corn	100	-
Archer Daniels Midland Co.	Decatur	IL	Corn	375	-
Archer Daniels Midland Co.	Marshall	MN	Corn	48	-
Archer Daniels Midland Co.	Peoria	IL	Corn	61	-
Arkalon Energy LLC	Liberal	KS	Corn	110	-
Attis Biofuels LLC	Fulton	NY	Corn	100	-
Aurora Cooperative Ethanol LLC - East	Aurora	NE	Corn	45	-
Aurora Cooperative Ethanol LLC - West	Aurora	NE	Corn	108	-
Badger State Ethanol LLC	Monroe	WI	Corn	90	-
Big River Resources Boyceville LLC	Boyceville	WI	Corn	62	-
Big River Resources Galva LLC	Galva	IL	Corn	125	-
Big River Resources West Burlington LLC	West Burlington	IA	Corn	112	-
Big River United Energy LLC	Dyersville	IA	Corn	130	-
Blue Flint Ethanol LLC	Underwood	ND	Corn	70	-
Bonanza BioEnergy LLC	Garden City	KS	Corn/Sorghum	55	-
Bridgeport Ethanol LLC	Bridgeport	NE	Corn	54	-
Bushmills Ethanol Inc.	Atwater	MN	Corn	90	-
Butamax Advanced Biofuels LLC	Scandia	KS	Corn	12	-
Calgren Renewable Fuels LLC	Pixley	CA	Corn	55	-
Carbon Green BioEnergy LLC	Lake Odessa	MI	Corn	50	-
Cardinal Ethanol LLC	Union City	IN	Corn	140	-
Cargill Inc.	Blair	NE	Corn	210	-
Cargill Inc.	Eddyville	IA	Corn	37	-
Cargill Inc.	Fort Dodge	IA	Corn	115	-
Center Ethanol Co. LLC	Sauget	IL	Corn	54	-
Chief Ethanol Fuels Inc.	Hastings	NE	Corn	70	-
Chief Ethanol Fuels Inc.	Lexington	NE	Corn	55	-
Chippewa Valley Ethanol Co.	Benson	MN	Corn	44	-
CHS Inc.	Annawan	IL	Corn	125	-
CHS Inc.	Rochelle	IL	Corn	115	-
CIE	Marion	IN	Corn	55	-
Commonwealth Agri-Energy LLC	Hopkinsville	KY	Corn	45	-
Corn LP	Goldfield	IA	Corn	75	-
Dakota Ethanol LLC	Wentworth	SD	Corn	50	-
Dakota Spirit AgEnergy LLC	Spiritwood	ND	Corn	65	-

Company	City	State	Feedstock	Production Capacity (mgy)	Capacity Under Construction/Expansion (mgy)
DENCO II LLC	Morris	MN	Corn	36	-
Diamond Ethanol LLC	Levelland	TX	Corn	40	-
Didion Ethanol LLC	Cambria	WI	Corn	50	-
Dynamic Recycling LLC	Bristol	TN	Waste Sugars/Alcohol	2	-
E Energy Adams LLC	Adams	NE	Corn	80	-
East Kansas Agri-Energy LLC	Garnett	KS	Corn	45	-
ELEMENT LLC	Colwich	KS	Corn/Sorghum/Cellulosic Biomass	70	-
Elite Octane LLC	Atlantic	IA	Corn	150	-
ESE Alcohol Inc.	Leoti	KS	Waste Seed Corn	2	-
Flint Hills Resources Arthur LLC	Arthur	IA	Corn	120	-
Flint Hills Resources Camilla LLC	Camilla	GA	Corn	120	-
Flint Hills Resources Fairbank LLC	Fairbank	IA	Corn	120	-
Flint Hills Resources Fairmont LLC	Fairmont	NE	Corn	125	-
Flint Hills Resources Iowa Falls LLC	Iowa Falls	IA	Corn/Cellulosic Biomass	120	-
Flint Hills Resources Menlo LLC	Menlo	IA	Corn	120	-
Flint Hills Resources Shell Rock LLC	Shell Rock	IA	Corn/Cellulosic Biomass	120	-
Fox River Valley Ethanol LLC	Oshkosh	WI	Corn	65	-
Front Range Energy LLC	Windsor	CO	Corn	40	-
Gevo Inc.	Luverne	MN	Corn	22	-
Glacial Lakes Energy LLC	Aberdeen	SD	Corn	50	-
Glacial Lakes Energy LLC	Huron	SD	Corn	30	-
Glacial Lakes Energy LLC	Mina	SD	Corn	140	-
Glacial Lakes Energy LLC	Watertown	SD	Corn	130	-
Golden Grain Energy LLC	Mason City	IA	Corn	145	-
Golden Triangle Energy LLC	Craig	MO	Corn	20	-
Grain Processing Corp.	Muscatine	IA	Corn	78	-
Grain Processing Corp.	Washington	IN	Corn	35	-
Granite Falls Energy LLC	Granite Falls	MN	Corn	62	-
GreenAmerica Biofuels Ord LLC	Ord	NE	Corn	57	-
Green Plains Atkinson LLC	Atkinson	NE	Corn	47	-
Green Plains Central City LLC	Central City	NE	Corn	110	-
Green Plains Fairmont LLC	Fairmont	MN	Corn	119	-
Green Plains Hereford LLC	Hereford	TX	Corn	105	-
Green Plains Madison LLC	Madison	IL	Corn	90	-
Green Plains Mount Vernon LLC	Mount Vernon	IN	Corn	88	-
Green Plains Obion LLC	Rives	TN	Corn	125	-
Green Plains Otter Tail LLC	Fergus Falls	MN	Corn	55	-
Green Plains Shenandoah LLC	Shenandoah	IA	Corn	80	-
Green Plains Superior LLC	Superior	IA	Corn	50	-
Green Plains Wood River LLC	Wood River	NE	Corn	120	-
Green Plains York LLC	York	NE	Corn	50	-
Greenfield Global Inc.	Winnebago	MN	Corn	48	-
Guardian Energy LLC	Janesville	MN	Corn	150	-
Guardian Hankinson LLC	Hankinson	ND	Corn	150	-
Guardian Lima LLC	Lima	OH	Corn	70	-
Heartland Corn Products	Winthrop	MN	Corn	120	-
Heron Lake BioEnergy LLC	Heron Lake	MN	Corn	72	-
Highwater Ethanol LLC	Lamberton	MN	Corn	66	-
Homeland Energy Solutions LLC	Lawler	IA	Corn	180	-
Husker Ag LLC	Plainview	NE	Corn	80	-
ICM Biofuels LLC	St. Joseph	MO	Corn	50	-
Iroquois Bio-Energy Co. LLC	Rensselaer	IN	Corn	55	-
KAAPA Ethanol LLC	Minden	NE	Corn	80	-

Company	City	State	Feedstock	Production Capacity (mgy)	Capacity Under Construction/Expansion (mgy)
KAAPA Ethanol Ravenna LLC	Ravenna	NE	Corn	125	-
Kansas Ethanol LLC	Lyons	KS	Corn	80	-
Lincolmland Agri-Energy LLC	Palestine	IL	Corn	62	-
Lincolnway Energy LLC	Nevada	IA	Corn	50	-
Little Sioux Corn Processors LLC	Marcus	IA	Corn	160	-
Louis Dreyfus Grand Junction LLC	Grand Junction	IA	Corn/Cellulosic Biomass	125	-
Louis Dreyfus Norfolk LLC	Norfolk	NE	Corn	50	-
Marquis Energy LLC	Hennepin	IL	Corn	400	-
Marquis Energy-Wisconsin LLC	Necedah	WI	Corn	50	-
Marysville Ethanol LLC	Marysville	MI	Corn	50	-
MGPI Processing Inc.	Atchison	KS	Corn	3	-
Mid America Agri Products/Wheatland LLC	Madrid	NE	Corn	49	-
Mid-Missouri Energy Inc.	Malta Bend	MO	Corn	60	-
Midwest Renewable Energy LLC	Sutherland	NE	Corn	28	-
MMI/EtoH Inc.	Aurora	CO	Waste Alcohol	3	-
MXI Environmental Services LLC	Abingdon	VA	Waste Alcohol	2	-
Nebraska Corn Processing LLC	Cambridge	NE	Corn	50	-
NewEnergyBlue LLC	Jamestown	ND	Wheat Straw	-	16
NuGen Energy LLC	Marion	SD	Corn	130	-
One Earth Energy LLC	Gibson City	IL	Corn	150	-
Parallel Products	Louisville	KY	Waste Sugars/Alcohol	5	-
Parallel Products	Ontario	CA	Waste Sugars/Alcohol	2	-
Pennsylvania Grain Processing LLC	Clearfield	PA	Corn	120	-
Pinal Energy LLC	Maricopa	AZ	Corn	55	-
Pine Lake Corn Processors LLC	Steamboat Rock	IA	Corn	80	-
Plymouth Energy LLC	Merrill	IA	Corn	55	-
POET Biorefining - Alexandria LLC	Alexandria	IN	Corn	68	-
POET Biorefining - Ashton LLC	Ashton	IA	Corn	56	-
POET Biorefining - Big Stone LLC	Big Stone City	SD	Corn	79	-
POET Biorefining - Bingham Lake LLC	Bingham Lake	MN	Corn	34	-
POET Biorefining - Caro LLC	Caro	MI	Corn	53	-
POET Biorefining - Chancellor LLC	Chancellor	SD	Corn	110	-
POET Biorefining - Cloverdale LLC	Cloverdale	IN	Corn	90	-
POET Biorefining - Coon Rapids LLC	Coon Rapids	IA	Corn	54	-
POET Biorefining - Corning LLC	Corning	IA	Corn	65	-
POET Biorefining - Emmetsburg LLC	Emmetsburg	IA	Corn	55	-
POET Biorefining - Fostoria LLC	Fostoria	OH	Corn	68	-
POET Biorefining - Glenville LLC	Albert Lea	MN	Corn	42	-
POET Biorefining - Gowrie LLC	Gowrie	IA	Corn	69	-
POET Biorefining - Groton LLC	Groton	SD	Corn	53	-
POET Biorefining - Hanlontown LLC	Hanlontown	IA	Corn	56	-
POET Biorefining - Hudson LLC	Hudson	SD	Corn	56	-
POET Biorefining - Jewell LLC	Jewell	IA	Corn	69	-
POET Biorefining - Laddonia LLC	Laddonia	MO	Corn	60	-
POET Biorefining - Lake Crystal LLC	Lake Crystal	MN	Corn	60	-
POET Biorefining - Leipsic LLC	Leipsic	OH	Corn	68	-
POET Biorefining - Macon LLC	Macon	MO	Corn	46	-
POET Biorefining - Marion LLC	Marion	OH	Corn	150	-
POET Biorefining - Mitchell LLC	Mitchell	SD	Corn	68	-
POET Biorefining - North Manchester LLC	North Manchester	IN	Corn	68	-
POET Biorefining - Portland LLC	Portland	IN	Corn	68	-
POET Biorefining - Preston LLC	Preston	MN	Corn	46	-

Company	City	State	Feedstock	Production Capacity (mgy)	Capacity Under Construction/Expansion (mgy)
POET Biorefining - Shelbyville LLC	Shelbyville	IN	Corn	80	-
POET Research Center Inc.	Scotland	SD	Corn	12	-
Prairie Horizon Agri-Energy LLC	Phillipsburg	KS	Corn/Sorghum	40	-
Pratt Energy LLC	Pratt	KS	Corn	55	-
Project LIBERTY	Emmetsburg	IA	Cellulosic Biomass	20	-
PureField Ingredients LLC	Russell	KS	Corn/Sorghum/Wheat Straw	55	-
Quad County Corn Processors	Galva	IA	Corn/Cellulosic Biomass	38	-
Red River BioRefinery LLC	Grand Forks	ND	Waste Sugars/Starch	17	-
Red River Energy LLC	Rosholt	SD	Corn	35	-
Red Trail Energy LLC	Richardton	ND	Corn	65	-
Redfield Energy LLC	Redfield	SD	Corn	60	-
Reeve Agri-Energy Inc.	Garden City	KS	Corn/Sorghum	13	-
Ringneck Energy LLC	Onida	SD	Corn	80	-
Seaboard Energy Kansas	Hugoton	KS	Cellulosic Biomass	25	-
Show Me Ethanol LLC	Carrollton	MO	Corn	51	-
Siouxland Energy Cooperative	Sioux Center	IA	Corn	90	-
Siouxland Ethanol LLC	Jackson	NE	Corn	80	-
South Bend Ethanol LLC	South Bend	IN	Corn	102	-
Southwest Iowa Renewable Energy LLC	Council Bluffs	IA	Corn	130	-
Sterling Ethanol LLC	Sterling	CO	Corn	50	-
Summit Natural Energy LLC	Cornelius	OR	Waste Sugars/Starch	2	-
Tate & Lyle PLC	Loudon	TN	Corn	110	-
Tharaldson Ethanol LLC	Casselton	ND	Corn	175	-
The Andersons Albion Ethanol LLC	Albion	MI	Corn	140	-
The Andersons Clymers Ethanol LLC	Clymers	IN	Corn	135	-
The Andersons Denison Ethanol LLC	Denison	IA	Corn	65	-
The Andersons Marathon Ethanol LLC	Greenville	OH	Corn	135	-
Three Rivers Energy LLC	Coshocton	OH	Corn	50	-
Trenton Agri Products LLC	Trenton	NE	Corn	50	-
Tyton NC Biofuels LLC	Raeford	NC	Corn/Tobacco	57	-
United Ethanol LLC	Milton	WI	Corn	62	-
United Wisconsin Grain Producers LLC	Friesland	WI	Corn	60	-
Valero Renewable Fuels Co. LLC	Albert City	IA	Corn	135	-
Valero Renewable Fuels Co. LLC	Albion	NE	Corn	135	-
Valero Renewable Fuels Co. LLC	Aurora	SD	Corn	140	-
Valero Renewable Fuels Co. LLC	Bloomingsburg	OH	Corn	135	-
Valero Renewable Fuels Co. LLC	Bluffton	IN	Corn	118	-
Valero Renewable Fuels Co. LLC	Charles City	IA	Corn	140	-
Valero Renewable Fuels Co. LLC	Fort Dodge	IA	Corn	140	-
Valero Renewable Fuels Co. LLC	Hartley	IA	Corn	140	-
Valero Renewable Fuels Co. LLC	Jefferson	WI	Corn	110	-
Valero Renewable Fuels Co. LLC	Lakota	IA	Corn	115	-
Valero Renewable Fuels Co. LLC	Linden	IN	Corn	135	-
Valero Renewable Fuels Co. LLC	Mount Vernon	IN	Corn	100	-
Valero Renewable Fuels Co. LLC	Riga	MI	Corn	57	-
Valero Renewable Fuels Co. LLC	Welcome	MN	Corn	140	-
VERBIO North America Corp.	Nevada	IA	Cellulosic Biomass	30	-
Western New York Energy LLC	Medina	NY	Corn	65	-
Western Plains Energy LLC	Campus	KS	Corn/Sorghum	50	-
White Energy Inc.	Hereford	TX	Corn/Sorghum	130	-
White Energy Inc.	Plainview	TX	Corn	120	-
Yuma Ethanol LLC	Yuma	CO	Corn	50	-
<b>U.S. TOTAL</b>				<b>17,436</b>	<b>16</b>

## THE ESSENTIALS



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