

Growing Beyond the RFS: A Pathway for Increasing Ethanol Demand

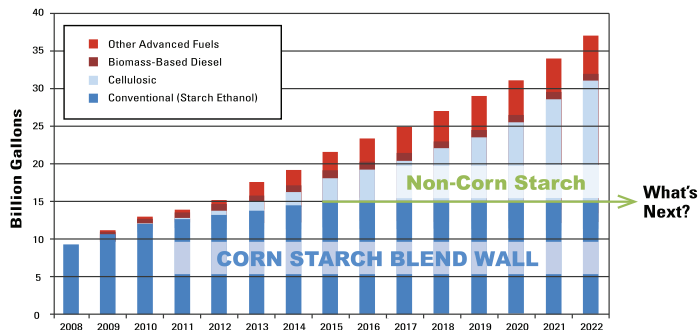


An Ethanol Across America White Paper

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The Federal Renewable Fuel Standard

Figure 1. Renewable Fuel Standard Volumes by Year



Corn Ethanol is Capped

The Renewable Fuel Standard, beginning with RFS 1 in 2005, was an effective demand pull mechanism that kick started the significant volumes of ethanol production we see today. RFS 2, as an extension of that program, also served to support domestic production. But it is currently mired in a regulatory morass and is limited in its ability to allow ethanol the free market access it needs to compete on a level playing field.

The increasing Volume Requirements of the RFS, as illustrated above, are not quite what they seem. The corn ethanol portion of the program is capped at 15 billion gallons annually, which is below the production level we are at today. This leaves no additional growth for corn ethanol under the RFS.

Ethanol production and utilization has only scratched the surface of its potential. The RFS is the entry ramp to the fuel market, but corn ethanol can do a lot more. Despite the limits on corn ethanol Congress put in place when creating the RFS, the Environmental Protection Agency (EPA) has the ability to help us expand beyond the constraints of a fixed RFS market, but has refused to take the necessary measures to do so.

The critical building blocks to complete this road are all within EPA's authority to enact, such as:

- Correcting the MOVES model and the lifecycle analysis of ethanol
- Removing unnecessary vapor pressure restrictions for higher blends
- Enforcing limitations of toxic aromatics in gasoline
- Raising minimum octane
- Streamlining the process for certification of higher blends up to E30
- Reinstating meaningful flex fuel vehicle credits
- Correct the R-factor carbon equation for auto manufacturers

Dave VanderGriend



Dave VanderGriend is Founder and CEO of ICM, Inc. In addition to leading ICM's Research and Development (R&D) initiatives and promoting the renewable fuels industry in conjunction with the Government Affairs division, Dave focuses on ways to sustain agriculture and build a stronger economy on a global level. Growing up on a farm outside Sheldon, Iowa, Dave experienced the importance of farming on the economy of rural America and has made it his mission to help sustain agriculture by finding innovative ways to turn grain into renewable energy such as ethanol.

Among other things, these actions would allow Auto Manufacturers to utilize ethanol's high octane value and offer refiners more options. Allowing higher blends up to E30 would offer consumers more choices at the pump, help lower fuel costs, and reduce emissions and our carbon footprint. With the expiration of the RFS in just 7 years, the transition to an open and free market **must begin now**. In fact, one could argue the tipping point for ethanol volumes to increase is in 4 years, given that it takes 3 years to finance, design, and build the expansion of the ethanol industry.

In this paper we will illustrate how each of the regulatory roadblocks EPA has put in front of us can be addressed and why **growing beyond the RFS, by increasing our access to the consumer, needs to be a priority of the agriculture and ethanol industries!**



Flex Fuel and Ethanol Optimized Vehicles

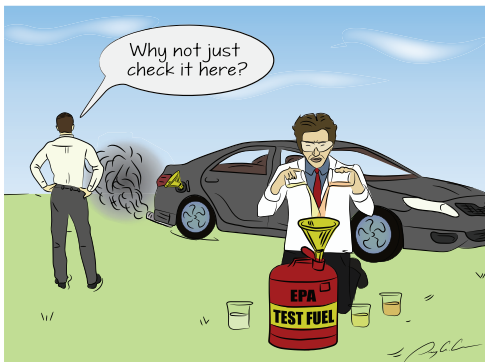
A critical piece of the puzzle to get more ethanol in the market is having vehicles that can take full advantage of the fuel. While conventional vehicles should be able to use higher ethanol blends up to E30, as we transition to that fuel and the infrastructure to dispense it, flex fuel vehicles are an important bridge. There is little if any difference in a flex vehicle and a conventional automobile and automakers could be incentivized to make all their cars capable of running on higher ethanol blends.

Continued

While incentives for automakers to produce ethanol vehicles have effectively been eliminated, electric vehicles (EVs) are heavily favored in the federal regulations. EV can contribute to an “All of the Above” strategy of reducing our consumption of petroleum and helping to clean the air, but will play a very small role in the near term.

Unlike ethanol FlexFuel vehicles that utilize existing infrastructure and fit in to the driving and fueling habits of consumers, EVs face a number of challenges, including range, cost, and infrastructure. And, vehicles utilizing higher ethanol blends require no taxpayer subsidies and can be available as a no cost option to consumers!

- Automobiles in Brazil, made by the same manufacturers of cars in the U.S., all operate on at least 27% ethanol blends, all the way up to 95%.
- Before EPA reduced the incentives to automakers, they produced 20 million flex vehicles that are on the road today in the U.S., illustrating the effectiveness of those incentives.
- Many auto experts and mechanics attest to the fact that there are little, if any, differences in conventional vehicles and those that can operate on higher ethanol blends.
- While ethanol has a slightly lower energy content, minor calibration adjustments to take advantage of ethanol’s high octane negate the energy difference and provide consumers with a higher quality fuel at a competitive price.
- Flex Fuel Vehicles can use any combination of ethanol and gasoline. They offer the ultimate in consumer choice, usually with no additional cost to consumers and no subsidies or tax credits.



The Importance of Real World Testing of Fuels

The use of ethanol is under the jurisdiction and control of the Environmental Protection Agency (EPA) which determines the environmental impact of ethanol fuels. That determination is made through laboratory testing, models, and computer projections that are often completely at odds with the composition of real-world consumer fuels that are actually in the market place.

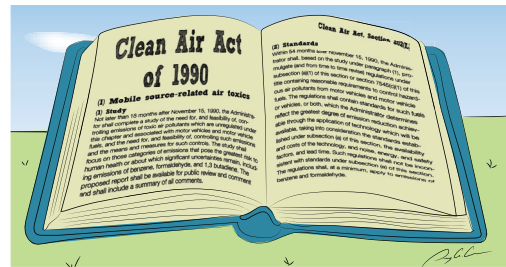
EPA certification fuels used to test auto emissions under-report tailpipe particulate emissions by 50% compared to fuels in the market used by consumers.

The test fuel procedures EPA uses ignore the ability of ethanol to reduce a range of harmful pollutants. In fact, EPA test fuels and

modeling will restrict the use of higher ethanol blends, requiring states to prohibit even E15.

The Volkswagen emission scandal should serve as a stern warning that real world measurements from tailpipe exhaust are the true indicator of a fuels’ ability to reduce harmful emissions, and that gasoline should be tested in that manner.

- Groups like the Urban Air Initiative, along with the states of Kansas and Nebraska, have taken EPA to court to challenge their testing and modeling.
- Ethanol blends can protect public health and reduce toxic particulates if EPA utilizes non-bias testing protocols.



Protecting Public Health and Enforcing the Law

When the Clean Air Act was amended in 1990 it was the first time the law had been modified since 1974. Those amendments included very important provisions addressing mobile sources, namely petroleum based fuels. In addition to including oxygenates like ethanol as a required additive to combat ozone, the law specifically banned lead and addressed the need to control mobile source air toxics, including the known carcinogen benzene, part of the deadly BTX group of toxics used to increase octane in consumer fuels.

Congress recognized that fuels and vehicles would evolve in the future and in order to ensure the maximum protection of public health required EPA to “from time to time” update its regulations to ensure that BTX was reduced to the “greatest achievable extent...as new technologies presented themselves”.

EPA conceded, in a 2007 Review of the air toxics provisions, that ethanol was a far superior source of octane but would not require its use under this program due to **insufficient supply!!**

- It is time for EPA to do its job, and protect the public health and welfare
- EPA should help ease automakers’ compliance burden by increasing the minimum octane standard for gasoline, and cap harmful benzene-based octane additives, replacing them with fuels like E30 “clean octane” blends.
- This would take advantage of unsubsidized ethanol’s highest and best use and help automakers comply with tighter fuel efficiency and carbon standard.
- This would unleash market forces to choose from the most efficient sources of ethanol, whether it be corn, sugarcane, cellulose, or even natural gas.

Figure 2.

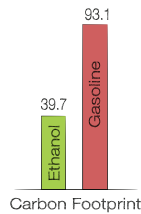


The Important Role of Corn in Reducing Carbon

Current science shows that corn ethanol can be a major contributor to the global effort to reduce carbon emissions. EPA's lifecycle carbon estimates for corn ethanol are outdated.

Numerous peer-reviewed studies confirm that high-yield corn, with its extensive below ground root structure, restores soil organic matter to such an extent that U.S. corn acres capture substantial amounts of CO₂. Corn acres are not a carbon **source**, but rather a significant carbon **sink**.

According to Agronomist and South Dakota State University Fellow Ron Alverson, an acre of corn will sequester one ton of CO₂ per year. EPA's models require significant updating to reflect corn ethanol's carbon sequestration benefits which would allow corn ethanol to compete in Low Carbon Fuel markets like California.



- An Acre of Corn converted to feed and ethanol produces nearly 450 gallons of fuel ethanol, which further reduces CO₂ emissions.
- This means that a properly managed U.S. corn industry, when corn ethanol's CO₂ tailpipe emissions are also factored in, could significantly reduce the carbon footprint of corn ethanol.
- Putting **more** ethanol in U.S. gasoline would result in significantly **less** CO₂ emissions .

The Real Story: Ethanol is a Cleaner, Healthier Fuel Choice

The EPA's MOVES Model matters because States are required to use this computer simulation to meet Federal air quality standards. When state regulators use the flawed model with ethanol blend inputs, and see that it falsely increases emissions and air pollution (shown in red), they will effectively be prohibited from using mid-level blends in their state. This manipulation limits the opportunity for consumers to choose clean burning ethanol at the pump.

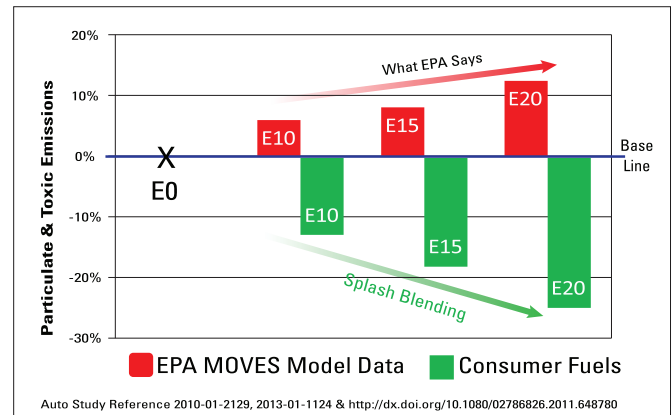
EPA's flawed models and testing procedures lead to incorrect conclusions that devalue ethanol and result in artificial barriers to the market.

By testing ethanol in lab fuels that are manipulated and effectively rigged, ethanol emissions, at least on paper, increase. However, adding ethanol in real world conditions

tells a different story. Splash blending ethanol on to finished gasoline **improves** emissions and **reduces** the health risk to the public (shown in green).

- Independent Auto Industry Studies have questioned EPA's testing procedures .
- "Splash Blending", i.e. adding more ethanol to existing E10 Blends significantly improves fuel quality and emissions, specifically toxic particles from the tailpipe.

Figure 3.



What Will We Do with All The Corn?

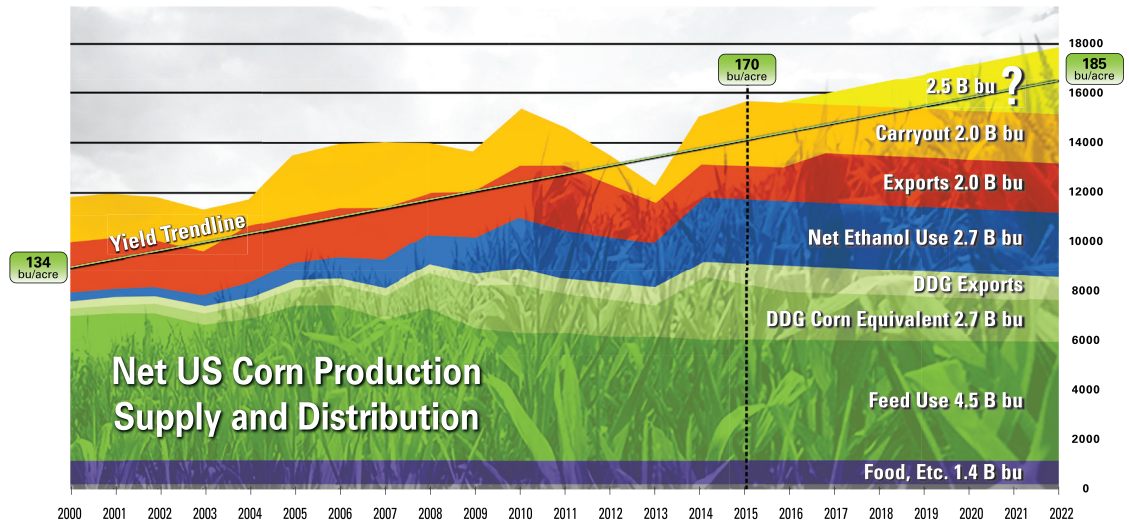
As corn yields per acre increase many sectors of demand are flattening. Existing infrastructure can support storage of 2 billion bushels as carryover but the US will see much more corn produced than that in a few short years. The question is not whether we will have enough corn for food, but instead, what will we do with all the corn?

Corn use for ethanol will flatten at about 5.3 billion bushels per year as corn ethanol is capped by the RFS. The DDG produced by ethanol plants will replace close to one half of the raw corn diverted from the feed market and used for ethanol. This could push approximately 2.6 billion bushels of corn equivalent back into circulation. This relentless growth in corn supply is driven by the ever increasing average corn yield, as U.S. farmers continue to grow more corn on less land. While corn acreage has fallen over the past 8 decades, yield per acre has more than tripled, and continues to grow. Without an expanded ethanol market acreage will continue to fall as prices and demand collapse.

- The ethanol industry is a critical market for corn. Without the regulatory relief that would allow ethanol true market access, the result could be a continuing decline in corn prices and a huge hit to the rural economy.
- There has not been any additional demand opportunity from any other sector other than biofuels.
- Exports are facing stiff international opposition and are expected to return to historical trends.

Figure 4.

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Growing Beyond the RFS

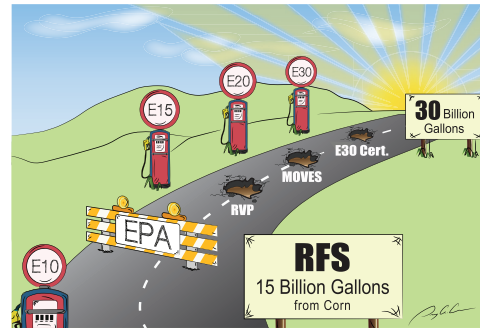
The fuel ethanol industry has grown exponentially over the past 15 years, from 2 billion gallons annually in 2000 to more than 15 billion as we enter 2016. The RFS was the primary driver of this growth by requiring increasing amounts of renewable fuels to be integrated into the motor fuel pool.

EPA regulations cap the amount of ethanol from corn under the RFS at 14.5 billion gallons for 2016, which is less than what was produced by U.S. ethanol industry in 2015. Without growing corn markets in the U.S. or internationally, in addition to capped RFS ethanol demand and increasing production yields, acreage will decrease. This will limit farm income.

Yet, we know we can responsibly produce significantly more ethanol from corn. This is increasingly important considering the lower volumes that are expected to come from the advanced and cellulosic sector. Even those volumes, however, will encroach on the market for corn ethanol under the RFS which means we simply must develop additional demand.

And we can—there is a market beyond the 15 billion gallons from corn under the RFS in the form of a gasoline pool of more than 130 billion gallons that need more clean, high octane ethanol, as

well as automobiles that can efficiently use mid-level blends, such as E30. The road is blocked by regulatory obstacles that can be overcome with effective leadership in Washington. We must not allow the full potential of corn ethanol to be defined by the limitations of the RFS. Working together with a team of Auto, Ag, Ethanol, Regulatory groups, and our elected leaders, we can create true demand by attaining free access to the market so consumers can choose ethanol. Let's keep a watchful eye on the RFS, while we also plan to grow beyond it.



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