



## Research

# The Renewable Fuel Standard's Policy Failures and Economic Burdens

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## Executive Summary

- The Renewable Fuel Standard (RFS), a requirement that biofuel be blended into gasoline, is intended to improve American energy security as well as reduce greenhouse gas emissions.
- Increased domestic energy production, as well as updated estimates of pollution from ethanol production, show the RFS to be unnecessary and even damaging—in addition to having cost fuel consumers \$76 billion over the past ten years.
- The Trump Administration is considering reforms to the program's compliance mechanisms to ease its burdens, but these cannot fix a fundamentally broken policy. The only solution is to repeal the RFS altogether.

## Introduction

A Philadelphia-based oil refinery filed for bankruptcy in January of 2018 and pinned blame for its failings on the Renewable Fuel Standard (RFS), a requirement that biofuel be blended into gasoline. This bankruptcy has renewed policymakers' focus on reforming the program, with the White House holding several meetings this year on the matter.

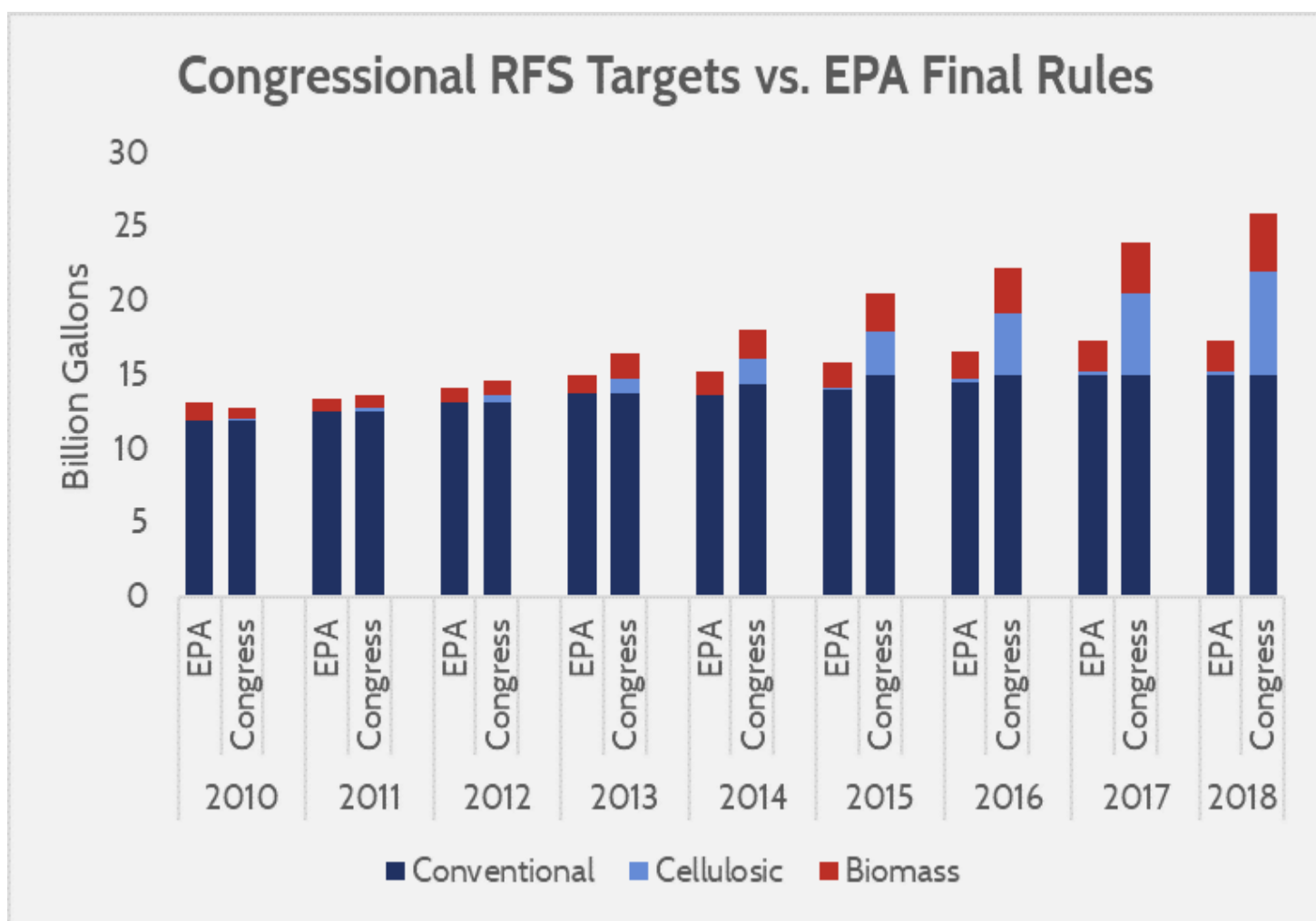
When Congress created the RFS in 2005, it was intended to lessen American dependence on Middle Eastern oil in the wake of 9/11 and terrorist threats from that region. Later, the environmental component was added to the RFS to promote cleaner alternatives to gasoline. Any attempt to reform the program should be viewed in light of the program's fundamental ability—or failure—to achieve these two goals.

After more than a decade, research indicates that the RFS has failed to achieve its policy goals and imposed burdens on the economy. At its heart, the RFS functions as a subsidy for biofuel producers—mostly corn growers—creating an economic distortion that raises the costs of food and fuel. Simple reforms to the RFS' compliance mechanisms would not alter this fundamental reality. Consequently, the best reform to the program would be to eliminate it entirely.

## Supply and Demand

The idea behind the RFS was that the United States would replace some of its oil imports with a domestic resource that was cheap and in abundance: corn. Oil prices were rising, but ethanol consumption was rising as well, and rising quickly. The 2005 Energy Policy Act created the RFS, and the 2007 Energy Independence and Security Act created legislative targets for blending corn-based ethanol and other biofuels with gasoline, as well as a secondary mandate of reducing greenhouse gas emissions. Congress likely anticipated that the targets it set would be well below demand, and thus the policy would be nearly costless.

These targets have proven to be too ambitious. In 2017, production of total biofuel, and especially advanced biofuels, fell far short of what Congress anticipated. A comparison of the congressional mandates to the Environmental Protection Agency (EPA) targets, which the agency sets based on the true availability of biofuel, illustrates this growing gap.



While the EPA targets for conventional (corn-based) ethanol matches the legal requirement, the capacity to produce other, more advanced forms of biofuel has fallen short almost every year, and increasingly so.

Further, other data show that the United States is not producing more conventional ethanol than the RFS mandate requires. This fact indicates that the real demand for ethanol, which was growing before the RFS

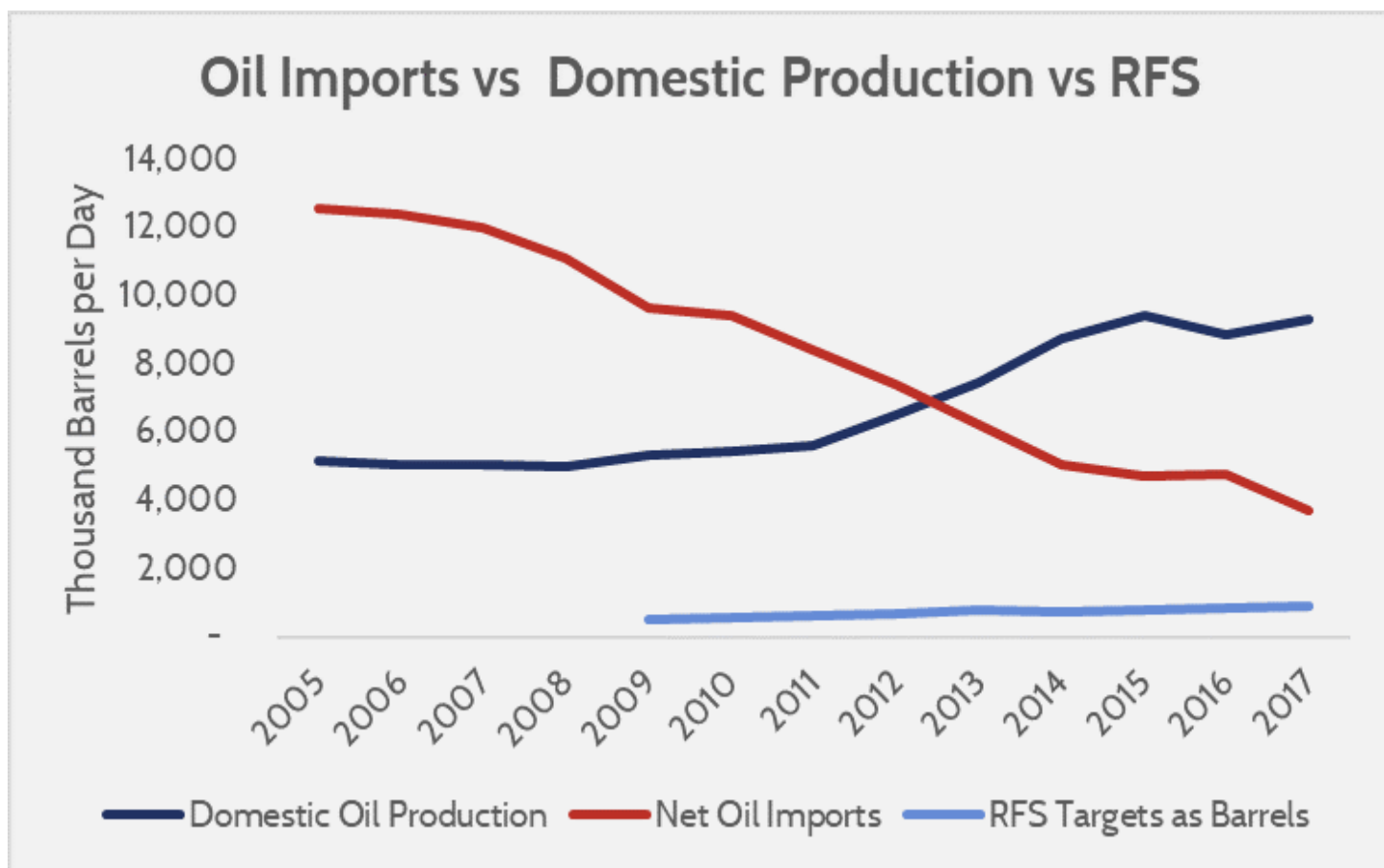
began, has plateaued and is likely less than the mandate requires. As a result, the mandate is artificially inflating demand for ethanol, which creates a host of issues as detailed below.

This inflated demand, however, could still be in line with the stated goals of the RFS: energy security and greenhouse-gas emissions reduction. The RFS is, after all, supposed to shift demand from one fuel type to another for a political purpose. But the data suggest that the RFS is probably not improving either energy security or the environment.

## The RFS and Energy Security

The principal objective of the RFS is to reduce oil imports, but the data indicates, ironically, that the RFS is instead undermining domestic oil production.

The chart below tracks domestic oil production and imports as well as the biofuel consumption mandated by the RFS.



As the chart shows, net imports have declined significantly since their 2005 peak. Ethanol production could have contributed to that decline, but increased domestic oil production likely contributed far more. By 2013 the United States was producing more oil than it was importing, and that gap has only widened since then, as the

chart illustrates. Bear in mind the RFS is indifferent to the source of oil that it supplants, and since more oil is produced domestically than imported on net, the RFS is more likely to displace a domestic oil source than a foreign one.

What's more, biofuels mandated by the RFS could at best have replaced only one-fourth of oil imported last year. To match the energy contained in a gallon of gasoline requires 1.5 gallons of ethanol, which means that the 15 billion gallons of ethanol consumption mandated by the EPA only replace 10 billion gallons of gasoline, or 652 thousand barrels per day of oil, and the 4.28 billion gallons of advanced biofuels replacing another 279 thousand barrels per day. Today, the United States imports on net around 3.7 million barrels of oil per day on average, meaning the fuels for the RFS produces enough energy to replace, at best, only 25 percent of the nation's net crude oil imports.

## The RFS and the Environment

The environmental component of the RFS has also failed. The EPA holds to the typical assumption that corn-based ethanol produces around 80 percent of the greenhouse gas emissions as gasoline. This figure, however, does not consider other pollutants associated with the production lifecycle of ethanol—especially particulate matter. A 2014 study by Christopher Tessum, Jason Hill, and Julian Marshall of the University of Minnesota found that corn-based ethanol [creates more pollution than gasoline](#).

Although the combustion of ethanol produces fewer pollutants than gasoline, most estimates of its lifecycle pollution exclude pollution from the energy required to produce and transport ethanol. The study by Tessum and his colleagues found that when the entire lifecycle of corn-based ethanol is evaluated, its monetized health impacts are 80 percent higher than gasoline—and that's after considering climate benefits. In short, corn-based ethanol is not likely any cleaner than conventional gasoline consumption.

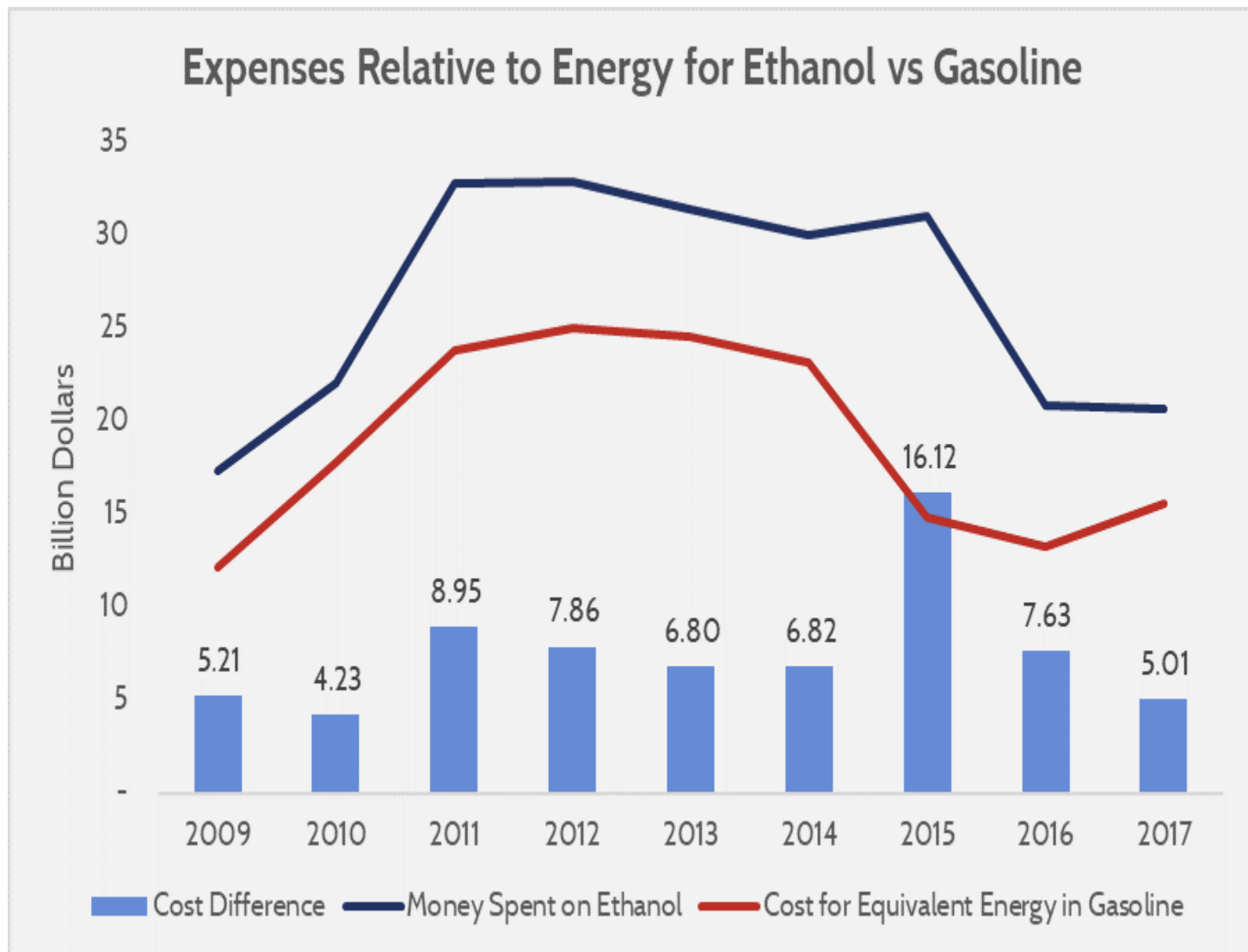
The RFS could also boost global consumption of gasoline. The lower domestic demand for oil reduces the global wholesale price for oil slightly, and thus in turn increases global demand. This interplay indicates that some of the domestic greenhouse gas reductions from ethanol usage are negated by increased gasoline consumption abroad.

## Costs to Consumers from the RFS

Since the RFS forces gasoline consumers to purchase ethanol, the program is effectively a wealth transfer from energy consumers to corn growers. This transfer raises two questions: How much money is going to the preferred industries, such as corn growers? And how much more are Americans spending to fuel their cars than they otherwise would?

The price of ethanol in 2017 averaged \$1.43 per gallon, and at 14.4 billion gallons of consumption (just under the mandated consumption of 15 billion gallons), consumers spent \$20.6 billion on ethanol. Ironically, this total is actually *less* than some other years, where the price of ethanol was much higher.

Of course, the RFS is meant to *substitute* for gasoline consumption. Thus, rather than asking how much was spent on the RFS, it is better to ask the cost difference in using ethanol versus gasoline. Since 1.5 gallons of ethanol matches the energy in one gallon of gasoline, 14.4 billion gallons of ethanol replaces only 9.5 billion gallons of gasoline. Comparing the difference in wholesale price, in 2017 Americans spent \$5 billion more on gasoline because of the RFS—and that’s the low end of what they have historically paid for the RFS, as the chart below demonstrates.



Over the past 10 years Americans spent a total of \$76.7 billion more on fuel because of the RFS, with the annual sum ranging from \$4 to \$16 billion annually. As a caveat, if the RFS were not in place, the demand for gasoline would be higher, which would put upward pressure on those prices. The total cost of the RFS should be thought of as somewhat less than \$76.7 billion, but likely still near that figure.

In addition to the higher costs imposed by the RFS requiring consumers to purchase a less efficient fuel, there are also costs associated with the mechanism for tracking compliance with the program. Biofuels that are blended under the RFS are sold with an identifier, known as a “renewable identification number” (RIN), which is purchased along with the biofuel and traded among refiners to meet RFS obligations. The RIN carries its own price tag, but that cost is not tracked in public data. The price of a RIN typically ranges from between \$0.30 and

\$1.00 (fluctuating based on seasonal demand, similarly to gasoline). Knowing exactly how much has been paid for RINs is difficult to gauge due to data scarcity, but back-of-the-napkin math indicates that it is currently increasing compliance costs by between \$5.8 and \$19.3 billion per year—costs which are almost certainly [passed on to consumers](#) at the pump.

In addition to higher fuel costs, the RFS almost certainly puts upward pressure on food prices. Resources for the Future, an environmentally focused think tank, estimated in 2016 that the combined effect of the United States' and European Union's renewable fuel mandates will raise global food prices [by 17 percent](#) more by 2022 (relative to 2005). In 2014, the Heritage Foundation assumed that the RFS consumes 10.8 percent of the world's corn, and causes a price increase for corn [of 68 percent](#). A study from Iowa State University estimates that the RFS increases corn prices by [between 8 and 34 percent](#).

Other studies that indicate the RFS has not impacted food prices may rely on assumptions that have not held true. In 2014, the Congressional Budget Office indicated that the impact of the RFS on food prices [would be negligible](#) because of continued high demand for ethanol, yet ethanol demand has plateaued and tracks the RFS mandates. A report from the RFS advocacy group Renewable Fuels Association (RFA) called the RFS' impact on food prices a "[colossal myth](#)," yet RFA's assessment is not relative to a baseline projection, and as such assumes that because productivity improved the increased demand for corn by the RFS could not have increased prices (a view that is inconsistent with basic economic theory).

Determining the impact of the RFS on food prices is difficult because it is hard to know what the demand for ethanol would be without the RFS, as well as how much consumers substitute for corn. Further, corn is only a fraction of food consumption, and government estimates of the RFS's impact on overall food prices tend to be very small (between 0.1 and 0.25 percent). The political environment indicates that the impact could be large, however: The energetic defense of the RFS from interest groups indicates that the RFS is propping up demand significantly, since if demand for corn were expected to be as high without the RFS, there would be only a marginal need to defend it.

## Proposed Reforms

Broadly, there are three ways the problems of the RFS can be approached. Firstly, policymakers can focus on the RINs. After biofuel is blended, the RIN is separated and can be bought on the open market. In theory, if biofuel is widely available then RIN prices should be low, but if demand is high the RIN prices will increase and incentivize new production.

As the mandate for biofuel forces demand to rise, the price of RINs increases, and production should rise to keep RIN prices down. There is some nuance to why RIN prices are high (tied to the nested nature of how different biofuel types can be used to satisfy the requirements of the RFS), but fundamentally the high prices are a function of supply and demand; the RFS set the demand too high, and the supply of biofuel is too low.

Proposed policy solutions for RINs have focused on capping prices or preventing non-industry players from participating in RIN markets. Such solutions may keep RIN prices low, but conventional wisdom would suggest that biofuel producers would make up for the loss by bidding up the wholesale biofuel price. The RINs simply help keep the price of biofuel used for RFS compliance separate from non-RFS biofuels, but if the fundamental supply and demand issue is unchanged, then the expected net price point would also be unchanged.

Aside from RINs, other potential policy solutions focus on the requirements of the RFS and attempting to ease the burdens to refiners. Last year, the EPA issued 25 waivers to refiners from RFS requirements. The EPA also barely edged up the RFS requirements from last year (19.29 billion gallons versus 19.28 billion gallons the prior year) and is reviewing the targets. Waivers, though, will be an ineffectual strategy that could possibly worsen the burdens of the RFS. Waivers are limited in the size of companies they can be awarded to, so such policies merely reward small refiners while shifting more of the burden onto larger ones. Such a policy only exacerbates the problems with government intervention.

Lower RFS targets would ease the burdens somewhat, but such a shift is easier said than done. Although the EPA can set new targets, revising them downward—especially by an appreciably significant amount—would surely kick off a wave of court cases over the congressional intent behind the RFS and the EPA’s authority to deviate from the 2007 statutory targets.

The only real solution to the RFS is to repeal it outright. Doing so will require congressional action, as well as presidential approval. Given that President Trump supported the RFS during his Iowa primary, and that the majority party in Congress represents many corn-growing states, the possibility of a full repeal in the near term is slight. Nevertheless, the fundamental problem with the RFS is that it mandates Americans to purchase a product that is in short supply, and ending the policy altogether is the only permanent solution for long-term relief.

## Conclusion

The RFS has failed to achieve its policy goals while imposing significant other costs on consumers. Reforming the program’s design would not fix these issues, as the core problem with the program is not the design but its premise: that the government mandates the use of biofuel to replace gasoline. If biofuel was economical, refineries would use it even without a government mandate.

While the RFS was bad policy when Congress created it, its impact has only worsened as the facts on the ground have shifted. The production of both advanced and conventional biofuels has not lived up to expectations, and increased domestic oil production makes it more likely that the RFS is competing more with domestic energy sources than energy exporters overseas.

It is time to end the RFS. The political rationale—energy security—is no longer relevant over a decade later. But the core problem has remained the same since the program’s inception: It could never hope to substitute for the efficiency of the market in rewarding the energy sources with the lowest cost.