BEYOND THE NUMBERS

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PRICES AND SPENDING

What happened to ethanol producer prices after passage of the Renewable Fuel Standard?

By Wander Cedeño

Few U.S. regulations designed to curb carbon emissions spark more discussion than legislation governing the Renewable Fuel Standard (RFS). The RFS program was designed by U.S. legislators to curb carbon emissions in transportation fuel. The program sets minimum requirements for refiners to produce transportation fuel using renewable sources. One of the main sources of renewable volume requirements is ethyl alcohol, commonly known as ethanol. Ethanol is produced by fermenting plant material, such as corn, sugar cane, or grasses.[1]

This **Beyond the Numbers** article uses Producer Price Index data to examine price movements for ethanol after the passage of the standard's two versions—Renewable Fuel Standard 1 (2005) and Renewable Fuel Standard 2 (2007). The article also discusses the Renewable Fuel Standard's impact on gasoline consumption and the Environmental Protection Agency's (EPA) volumetric targets.

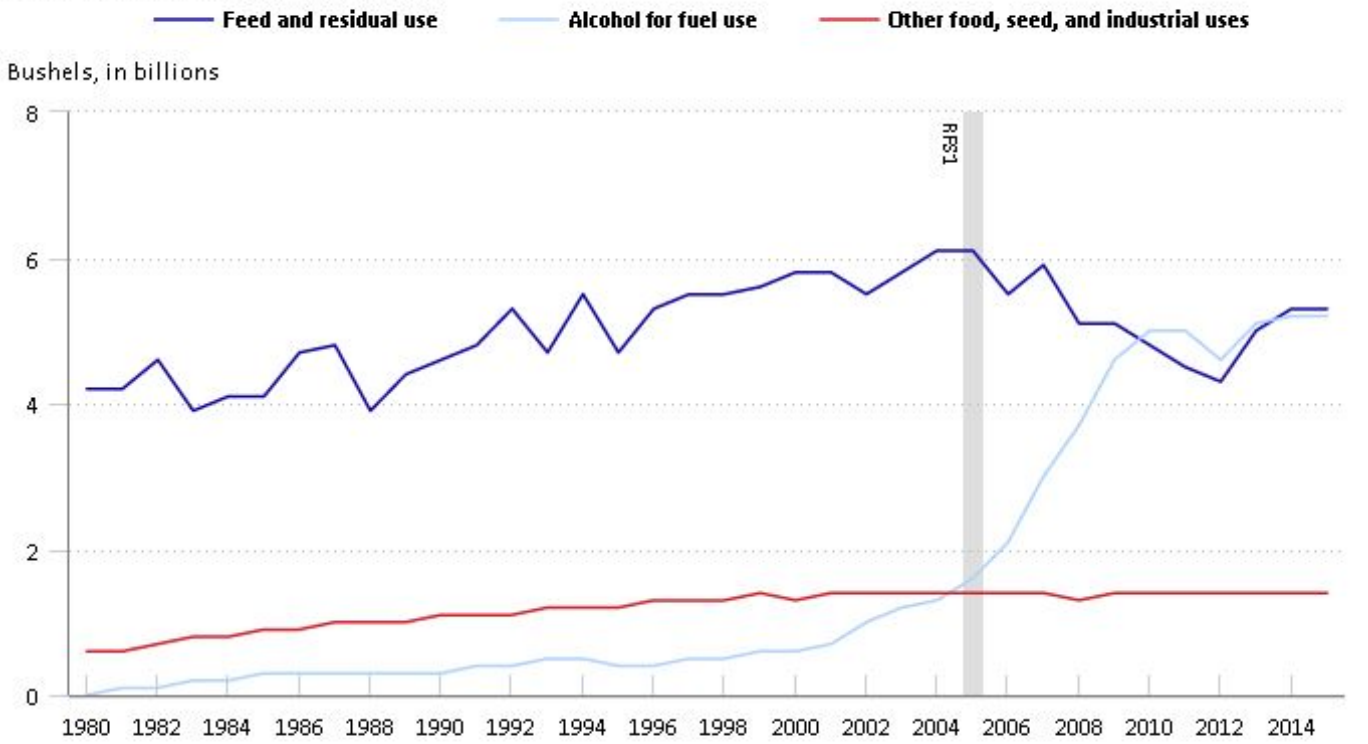
Passage of the Renewable Fuel Standard

The origins of RFS can be traced to the Energy Policy Act (EPAct) of 2005.[2] Through EPAct, legislators sought to address rising energy costs and growing dependency on foreign oil. They also hoped to spur economic growth by providing tax incentives and loan guarantees for green energy production. Another provision increased the amount of biofuel that must be mixed with domestically sold gasoline.[3] As such, the EPAct created RFS1 and ushered in the mass production of biofuels. This led to a burgeoning industry of ethanol production.

Data from the Department of Agriculture on domestic corn use highlight this trend, as corn is the primary source of ethanol in the United States. The quantity of corn apportioned for ethanol production compared with the quantity for other uses changed significantly following RFS1 implementation.[4] Renewable fuel targets were put into effect in 2006, resulting in an unprecedented increase in the level of ethanol output. The RFS1 regulation mandated the blending of 4.0 billion gallons of renewable fuel, about 2.78 percent of fuel dispensed or distributed, into the U.S. gasoline supply. In comparison, Americans consumed 141.8 billion gallons of gasoline (388.6 million gallons a day) in 2006.[5] The required levels of renewable fuel blending increased by 700 million gallons each year through 2011, eventually reaching 7.5 billion gallons by 2012.[6]

During the 2006–14 period, the amount of corn used for fuel rose from 2.1 billion bushels to 5.2 billion bushels, a 147.6-percent increase. Over the same period, corn for feed and residual use, while still the primary domestic use of the corn supply, declined. Chart 1 depicts ethanol's increasing share of domestic corn usage. In 2005, corn used for ethanol consumed 17.6 percent of total domestic corn supply; in 2014, the share was 43.7 percent.

Chart 1. U.S. domestic corn use before and after passage of the Renewable Fuel Standard (RFS), 1980–2014



Note: The Environmental Protection Agency administers the Renewable Fuel Standard (RFS) program setting minimum requirements for refiners to produce transportation fuel using renewable sources. RFS1 was passed in 2005 and implementation began in 2006.
Click legend items to change data display. Hover over chart to view data.
Source: U.S. Department of Agriculture.

Two years after the passage of EPAct, Congress enacted another piece of legislation, the Energy Independence and Security Act of 2007 (EISA) to further address high energy prices, handle concerns over climate change, and promote energy independence.[7] EISA introduced the second iteration of the Renewable Fuel Standard, commonly referred to as RFS2, which included the following key provisions:

- Added diesel fuel into the program
- Set volume requirements for other new categories of renewable fuel
- Quadrupled the volume of renewable fuel required to be blended into transportation fuel from 9 billion gallons (in 2008) to 36 billion gallons (in 2022)
- Required the EPA to apply lifecycle greenhouse gas performance threshold standards

Chart 2. Producer Price Index for ethanol before and after Renewable Fuel Standard (RFS) mandates, 2005—14

Note: The Environmental Protection Agency administers the Renewable Fuel Standard (RFS) program setting minimum requirements for refiners to produce transportation fuel using renewable sources. RFS1 occurred in 2005; RFS2 occurred in 2007 and implementation began a year later. Click legend items to change data display. Hover over chart to view data.
Source: U.S. Bureau of Labor Statistics.

Price behavior of ethanol after passage of the RFS

The PPI for ethanol measures the change in prices received by ethanol producers for the sale of their products. In 2006, the index jumped 24.8 percent after RFS1 implementation, reflecting a surge in demand. (See chart 2.) Driven by tax credits and blending mandates, refiners sought to expand capacity in 2007. Despite the increase in capacity, due to higher levels of usage the PPI for ethanol increased an additional 6.7 percent.[8] The ethanol index rose 8.9 percent in 2008, following EISA and the adoption of RFS2. It remained flat during the first half of 2009. However, in the latter half of 2009, the Great Recession tapered gasoline consumption, and ethanol prices decreased 12.2 percent for the year. In 2010, farmers earmarked an increasing share of corn for ethanol production, limiting the quantity available for food and feed use.[9] As a result, ethanol prices fell 8.3 percent in 2010, while prepared animal feed prices climbed 7.3 percent. The ethanol index recovered sharply in 2011, rising 36.0 percent because of strong export demand from Brazil.[10]

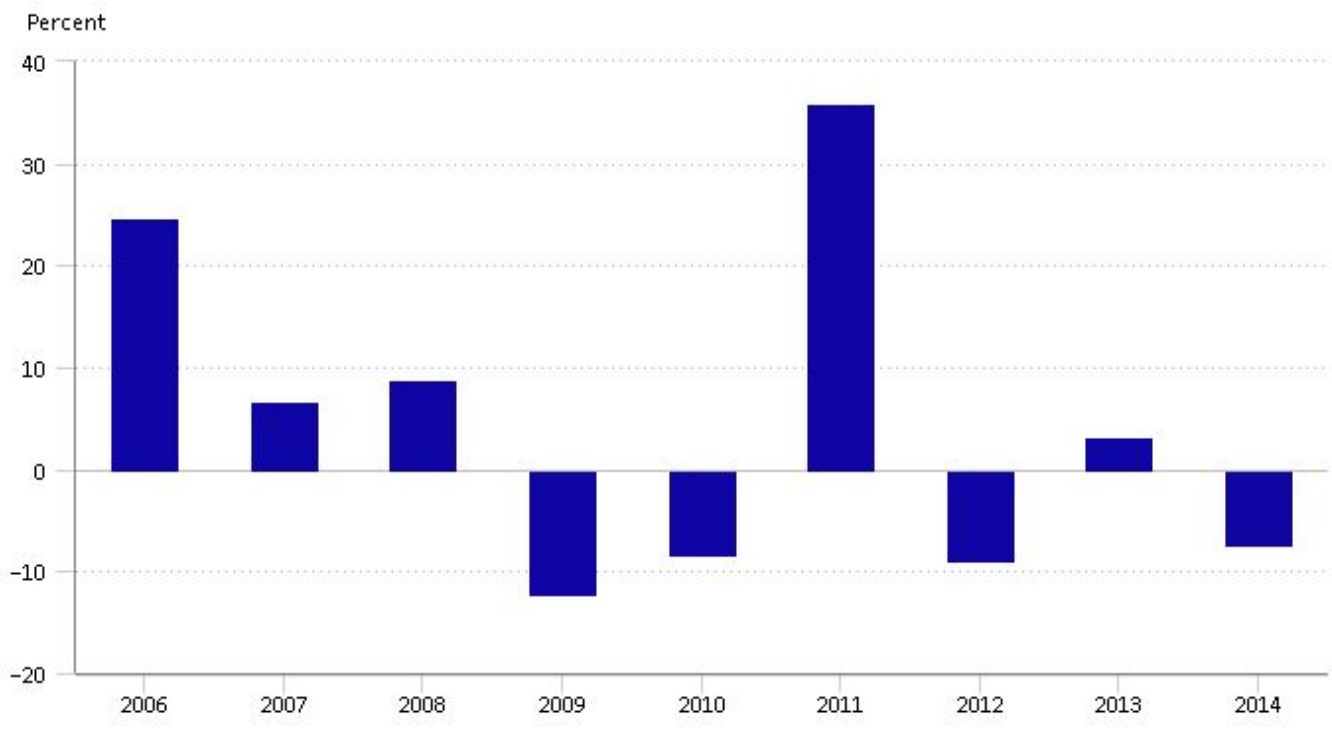
Relationship between corn, subsidies, and ethanol

From 1978 through 2011, domestic ethanol producers received a tax exemption ranging between 40 to 60 cents per gallon, bolstering profits.[11] In 1980, an additional regulation placed a 54-cents per gallon tariff on imported ethanol that also helped maintain a solid market for corn. The expiration of these subsidies at the close of 2011—combined with a historic drought throughout the Corn Belt in 2012—resulted in decreased ethanol exports amid rising corn prices.[12] Higher corn demand from livestock producers prompted a rise in corn allocation to animal feed

production and a reduction in the amount of corn allocated to ethanol production. In response, ethanol prices rose 3.3 percent in 2013.[13] From a demand perspective, ethanol exports reached their second-highest level on record in 2014, at 826 million gallons—an increase of 33 percent from the previous year. A record yield of 14.2 billion corn bushels and limitations for blending ethanol into domestic gasoline triggered the export surge.[14] Even so, corn oversupply precipitated a 7.5-percent price decrease in the ethanol index for the year.

Based on annual average data for the PPI for ethanol, from 2005 to 2014, ethanol prices increased 38.3 percent and averaged a yearly rise of 4.8 percent. Price fluctuations are a reflection of market conditions, which can change quickly. Chart 3 illustrates the annual percentage changes in the PPI for ethanol since 2006.

Chart 3. Annual percentage changes in Producer Price Index for ethanol, 2006–14

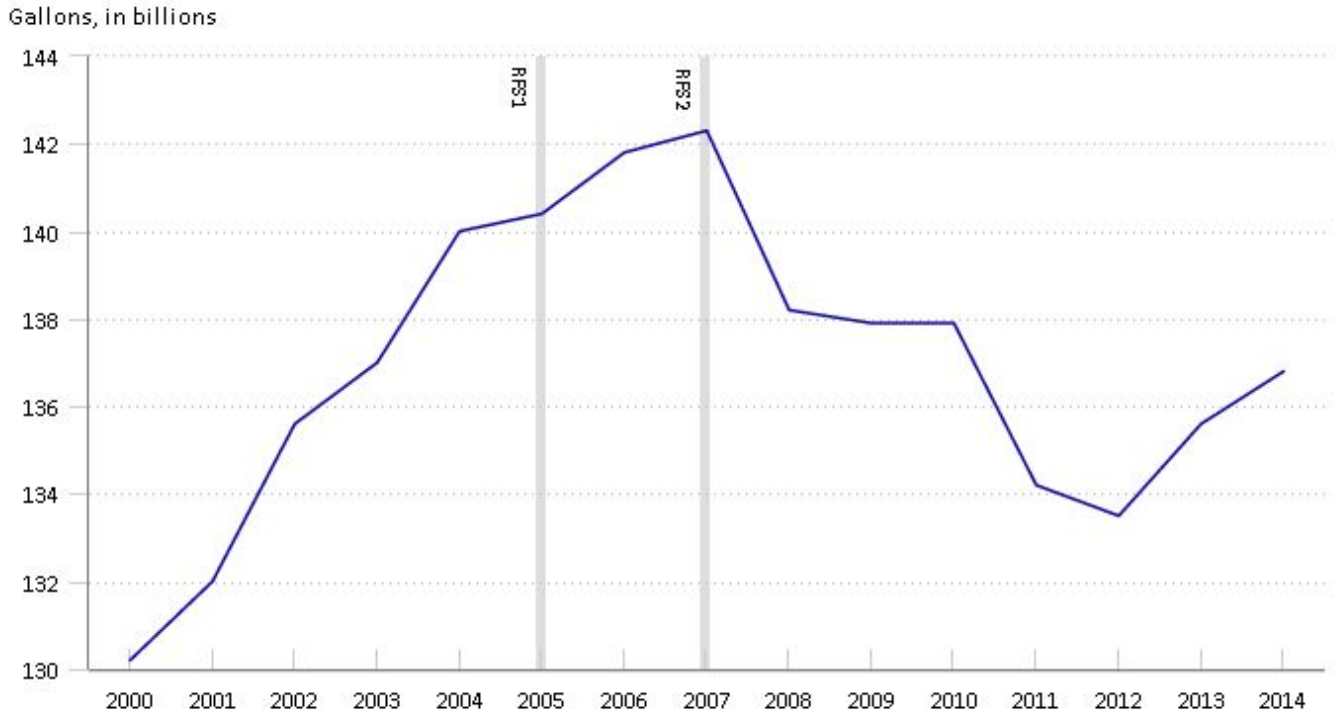


Hover over chart to view data.
Source: U.S. Bureau of Labor Statistics.

Renewable Fuel Standard's impact on petroleum product supply

The Energy Information Administration (EIA) publishes statistics tracking *petroleum product supplied*, which measures demand for transportation fuel.[15] In the period preceding RFS1 (2000–05), product supplied grew at an average of 1.5 percent per year; during 2006–14, the figure decreased 0.3 percent yearly. Chart 4 plots product supplied of finished motor gasoline in the 2000–14 period.

Chart 4. U.S. product supplied of finished motor gasoline, before and after the Renewable Fuel Standard (RFS), 2000–14



Note: The Environmental Protection Agency administers the Renewable Fuel Standard (RFS) program setting minimum requirements for refiners to produce transportation fuel using renewable sources. RFS1 occurred in 2005; RFS2 occurred in 2007. Product supplied measures "the disappearance of a product from primary sources," which in this chart is the disappearace of finished motor gasoline.
Hover over chart to view data.
Source: U.S. Energy Information Administration.

Americans consumed 5.5 billion gallons less motor gasoline in 2014 than they did in 2007 (a 3.9-percent decrease), when total consumption was a record high of 142.3 billion gallons. This curtailment of gasoline consumption is due in part to the fuel efficiency standards brought about by RFS2, as well as, residual impacts of the Great Recession.[16] Although reducing gasoline usage was a goal of RFS2 framers, refiners have recently expressed compliance concerns relating to continued annual percentage increases in renewable fuel standards for gasoline and diesel fuel production. The refiners' worries stem from the possibility of exceeding the *blend wall*.

The blend wall

The EPA defines the *blend wall* as logistical and economic barriers of expanding to blends beyond E10, which is 90 percent petroleum-based fuel and 10 percent ethanol.[17] Refiners are hesitant to produce higher blends, such as E12 or E15, as they can damage the engines of older cars, boats, and electrical equipment.[18] Waning consumption and higher efficiency vehicles have also threatened compliance thresholds. As a result, the agency scaled back the mandated volumetric growth of renewables for the first time on November 30, 2015. The decision finalized target levels for 2014, 2015, and 2016.[19] Table 1 presents these figures. In this table, units for all volumes are ethanol-equivalent, except for biomass-based diesel volumes, which are expressed as physical gallons.

Table 1. Final renewable fuel volumes, 2014–16 (billion gallons)

Type of fuel	2014	2015	2016
See footnotes at end of table.			
Cellulosic biofuel	0.033	0.123	0.230
Biomass-based diesel	1.630	1.730	1.900
Advanced biofuel	2.670	2.880	3.610
Renewable fuel (ethanol)	16.280	16.930	18.110
Source: U.S. Environmental Protection Agency.			

Tracking ethanol

Moving forward, policymakers will continue to utilize Renewable Fuel Standard targets to promote lower greenhouse emissions. Ethanol prices will fluctuate in response to these mandated levels of production and usage, and will be largely tied to changes in corn prices. The Department of Agriculture expects corn prices to increase moderately, from $3.50 to $3.75 per bushel from 2017 to 2025.[20] The PPI program will follow developments to the Renewable Fuel Standard and continue to produce an accurate measure of ethanol price indexes, which, as a reflection of market conditions, can change quickly.

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NOTES

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[12] For more information about ethanol subsidy expirations see, Robert Pear "After Three Decades, Tax Credit for Ethanol Expires," *The New York Times*, January 1, 2012, http://www.nytimes.com/2012/01/02/business/energy-environment/after-three-decades-federal-tax-credit-for-ethanol-expires.html?_r=0. Also, the term Corn Belt typically refers to the portion of the Midwest centered around northern Illinois, northern Iowa, southern Minnesota, east central Nebraska and surrounding areas.

[13] Julie Ingwersen, Mark Weinraub, Tom Polansek, Sam Nelson, and Michael Hirtzer, "Demand for record U.S. corn crop tops expectations-USDA," *Reuters*, November 8, 2013, http://www.reuters.com/article/usa-agriculture-crops-idUSL2N0IT1BM20131108.

[14] "U.S. ethanol exports in 2014 reach highest level since 2011," *United States Energy Information Administration*, Sean Hill, March 26, 2015, https://www.eia.gov/todayinenergy/detail.cfm?id=20532.

[15] "How much gasoline does the United States consume?" *United States Energy Information Administration*, http://www.eia.gov/tools/faqs/faq.cfm?id=23&t=10. Also, according to EIA, product supplied is a proxy figure for overall demand since it measures "the disappearance of a product from primary sources, such as refineries natural gas processing plants, blending plants, pipelines, and bulk terminals."

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