



Renewable Energy Analytics

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Thunderstruck, Part 2 - Producers of Renewable Diesel, Sustainable Aviation Fuel to Gain from New Climate Bill

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Conversations about decarbonization and the energy transition often turn to the transportation sector, which accounted for about 27% of U.S. greenhouse gas (GHG) emissions in 2020. Electric vehicles typically dominate these talks, but alternative fuels like renewable diesel (RD) and sustainable aviation fuel (SAF) also come up, not only because of their lower emissions but also because they are considered “drop-in” replacements for conventional diesel and jet fuel. Policies at the state and national level have already encouraged some production growth, but a tax credit established as part of the recently enacted Inflation Reduction Act (IRA) provides a major incentive for cleaner fuels. In today’s RBN blog, we look at the new 45Z Clean Fuel Production Credit (CFPC), how it will impact the production of RD and SAF, and why facilities that can produce fuels with the lowest carbon intensity (CI) stand to benefit the most.

The IRA, which we wrote about in Name Game and was signed into law August 16, includes several of President Biden’s biggest clean energy priorities. A promise to reduce fossil-fuel usage and GHG emissions and promote the development of a clean-energy industry was a key part of Biden’s 2020 campaign and he took several actions shortly after taking office, but passage of the IRA is by far the most significant development. To date, the main incentive for RD producers has been the federal Blender’s Tax Credit (BTC). The BTC was established under Section 40A of the Internal Revenue Code and provides a tax credit of \$1/gal for biodiesel or RD included in a “qualified biodiesel mixture” that is either used or sold as a fuel. RD, like biodiesel, is a biomass-based fuel that can be burned in diesel engines or used as heating oil for homes. Those federal tax credits, along with policies like California’s Low Carbon Fuel Standard (LCFS), have played key roles in the development of alternative transportation fuels like RD and SAF (see our Come Clean series). The BTC was set to expire at the end of 2022, but the IRA’s passage has extended its life by two years, with RD now eligible for the credit until the end of 2024.

The IRA also creates a new section of the tax code — 40B — to extend the BTC to SAF, which is considered to be one of the most promising options to reduce GHG emissions in the aviation

sector, where electrification is challenging due to battery weight. To claim the credit for SAF, a producer will need to certify that the fuel's lifecycle GHG emissions are reduced by at least 50%. The SAF credit will be equal to \$1.25/gal plus an additional \$0.01 for each percentage of lifecycle emissions reduction that exceeds 50%. (If the emissions are reduced by 100%, the SAF credit would be \$1.75/gal.) That means that producers of low-CI SAF, such as Fidelis New Energy, whose planned GigaSystem project we detailed in Part 1 of this blog, will have a significant advantage over market competitors unable to match those CI scores. But as we said, the BTC only runs through 2024 and the tax credit taking its place will swing the advantage even more in the favor of low-CI fuel producers.

Clean Fuel Production Credit

Under the BTC, it's easy to determine how quickly a producer's tax credits add up — they earn a credit for each gallon of RD they make, and a fuel's CI is not a factor. (As noted above, SAF was not previously eligible for the BTC, but is now.) The tax credit is a little more nuanced for both fuels under 45Z, also known as the CFPC, which begins in 2025 and runs through 2027 and is designed to incentivize the production of low-emissions transportation fuel, not including hydrogen. (The IRA also created the Hydrogen Production Tax Credit, 45V, a topic for another blog.)

There are two components of the new tax credit, the base credit and the emissions factor, which takes into account a fuel's lifecycle GHG emissions rate, which is comparable to its CI score. The tax credit's full amount is equal to the base credit (\$1/gal for RD, \$1.75/gal for SAF, both of which will adjust for inflation) multiplied by the emissions factor. The full credit amount (see example below) for RD with a lifecycle emissions rate of minus 10 kg of carbon dioxide equivalent per MMBtu (CO₂e/MMBtu) is calculated by A) subtracting the fuel's emissions rate (minus 10) from 50, B), dividing that figure by 50, then C) multiplying that number by the base credit to get the final credit amount.

$$\text{Step A) } 50 - (-10) = \mathbf{60}$$

$$\text{Step B) } \mathbf{60} / 50 = \mathbf{1.20}$$

$$\text{Step C) } \mathbf{1.20} * \$1 = \mathbf{\$1.20 \text{ tax credit}}$$

To see how the new calculation benefits producers of low-CI fuels, let's look at two scenarios for RD and SAF production. Figure 1 below shows the potential tax credit for RD based on the type of feedstock used (soybean oil, tallow, distillers corn oil, yellow grease) and the resulting CI of each fuel. Scenario A shows the final credit for fuels produced at retrofit facilities with typical emissions rates, which accounts for nearly all of today's output. Scenario B shows the final credit for fuels with low- or negative-CI scores. A quick word of thanks to our friends at Fidelis New Energy for helping us figure out the implications of the new tax credit. We'll be using their facility as the example under Scenario B. As we noted in Part 1 of this blog, the Fidelis strategy utilizes carbon capture and sequestration and carbon-negative power to produce low- or negative-CI fuels.

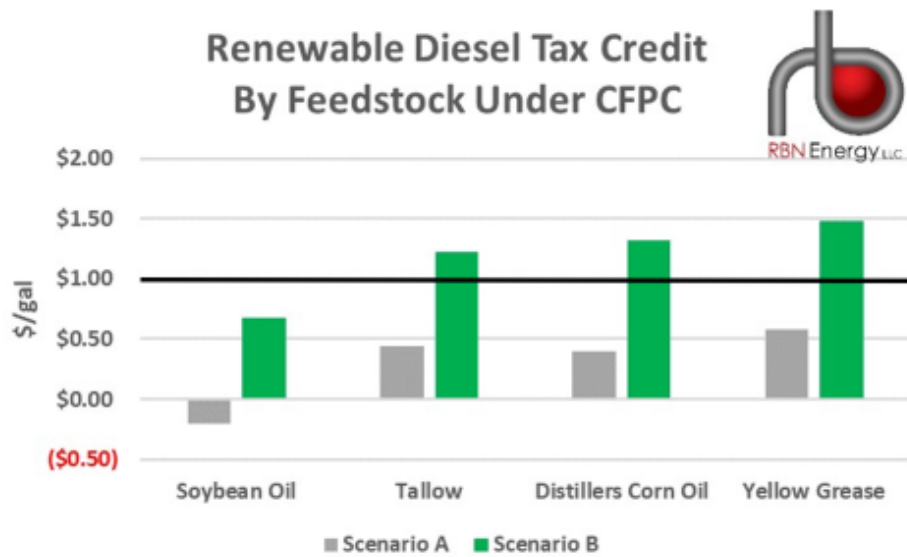


Figure 1. Renewable Diesel Tax Credit by Feedstock Under Clean Fuel Production Credit.

Sources: RBN, Fidelis New Energy

As shown in Figure 1, producers of RD under Scenario A not only see their tax credits reduced in comparison to the BTC (black line) or eliminated, no matter which feedstock is used, they also become significantly less competitive against Scenario B producers. (Also note that Scenario A producers would not owe the government anything if the credit formula produced a negative number, as with soybean oil in Figure 1. They just wouldn't qualify for a credit.) Under Scenario B, producers of RD will see their tax credits under the CFPC jump significantly from current levels except for when soybean oil is used as a feedstock. ([Click here \(https://rbnenergy.com/sites/default/files/RD-and-SAF-table.pdf\)](https://rbnenergy.com/sites/default/files/RD-and-SAF-table.pdf) for a table showing the breakdowns for RD and SAF under each scenario.)

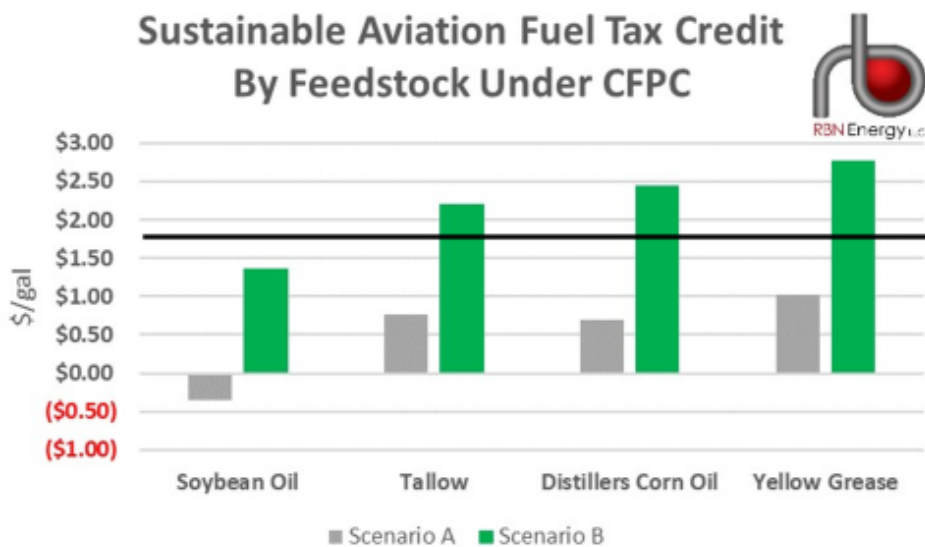


Figure 2. Sustainable Aviation Fuel Tax Credit by Feedstock Under Clean Fuel Production Credit.

Sources: RBN, Fidelis New Energy

It's a similar situation for SAF production, except the differences in the tax credit are even more beneficial for Scenario B producers. Under the BTC, which includes SAF production starting next year, the credit can hit \$1.75/gal (black line in Figure 2) if emissions are reduced by 100%. But once the CFPC comes into effect, Scenario B producers will be able to earn credits at well above that level in most instances, while Scenario A producers will again see their tax credits drop or eliminated.

Producers of low-CI fuels also benefit from California's LCFS, which sets CI limits on the finished gasoline and diesel consumed in the state each year. Petroleum-based fuels have a higher CI than the annual limits and renewable fuels are generally below the annual limits. If a fuel has a CI below the limit, it generates a credit, so the lower the CI score, the bigger the credit. The U.S. does not have a federal LCFS policy in place; however, at the national level it does have the Renewable Fuel Standard (RFS), which mandates a Renewable Volume Obligation (RVO) that must be met every year. Both policies have been reasons behind the recent growth in RD production.

Driven by these factors, there's a lot of RD and SAF capacity already online or in the planning stages, but the bottom-line impact of the IRA's passage is this: a fuel's CI now matters on a national level for the first time and it could dramatically reshape how RD and SAF are produced.

Impact on Feedstocks

One factor that is critical to the success of any renewable fuels project is feedstock availability. There are a couple of ways renewable feedstocks may be employed in renewable fuel manufacturing: 1) directly for fuel production (such as soybean oil and others noted above) and 2) as part of a carbon-negative power plant integrated into the overall site, as is the case with Fidelis. (For more on carbon-negative power and how it works, see Into the Woods and Space Oddity.) Historically, growth in the renewable fuels market has been hampered by two factors — uncertainty about the demand for renewable fuels and feedstock supply limitations. The passage of the IRA and the change to the tax credit may help allay some of the demand concerns, but will feedstock supply be able to meet the anticipated surge in demand? And as feedstock demand increases, will higher costs cause some plants to shut-in production?

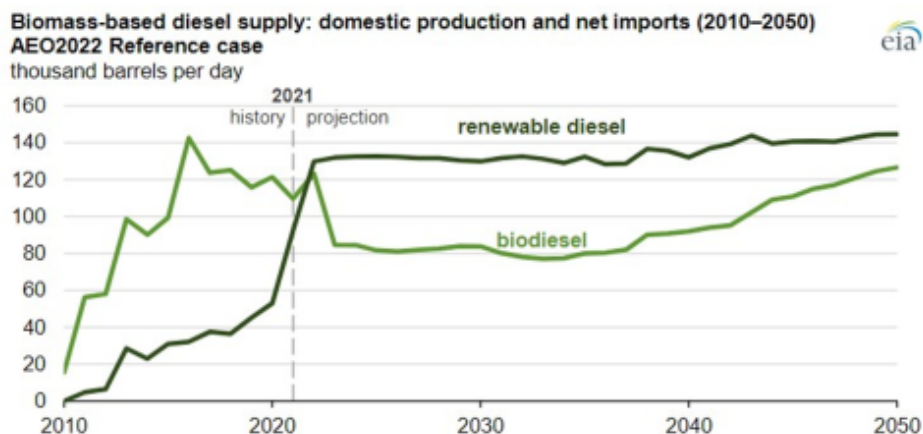


Figure 3. Biomass-Based Diesel Supply, 2010-50. Source: EIA

A quick glance at production data from the Energy Information Administration (EIA) shows how quickly things have changed. As shown in Figure 3 above, U.S. production of RD, plus net

imports, was at nearly zero a decade ago, just short of 100 Mb/d in 2021 and expected to hit 130 Mb/d in 2022, then gradually increase to 145 Mb/d by 2050, according to the EIA's Annual Energy Outlook 2022. RD production is expected to surpass biodiesel in the next couple of years, so that will also have an impact on feedstock demand. RD requires about 8.5 pounds of feedstock per gallon (lb/gal), up from about 7.5 lb/gal for biodiesel. A feedstock deficit of 13 billion lb is possible by 2024, according to a Goldman Sachs report from 2021, as more biofuels production comes online.

The trends in SAF production will only add to concerns about feedstock supply. While SAF currently makes up only a small fraction of the fuel supplied to the aviation industry, Biden established plans last year to dramatically boost production. Under the Sustainable Aviation Fuel Grand Challenge, which the White House announced in September 2021, SAF production would grow to 3 billion gal/year by 2030 and reach 35 billion gal/year — enough to meet 100% of domestic demand — by 2050.

Given the changes that are likely on the horizon, there is going to be a greater emphasis on developing new feedstocks such as camelina, carinata, pennycress, pyrolysis oil and algae oil, several of which may become increasingly viable in the coming years. There is also likely to be a greater emphasis on adding to and improving the infrastructure used to collect some feedstocks already in use, such as tallow and yellow grease.

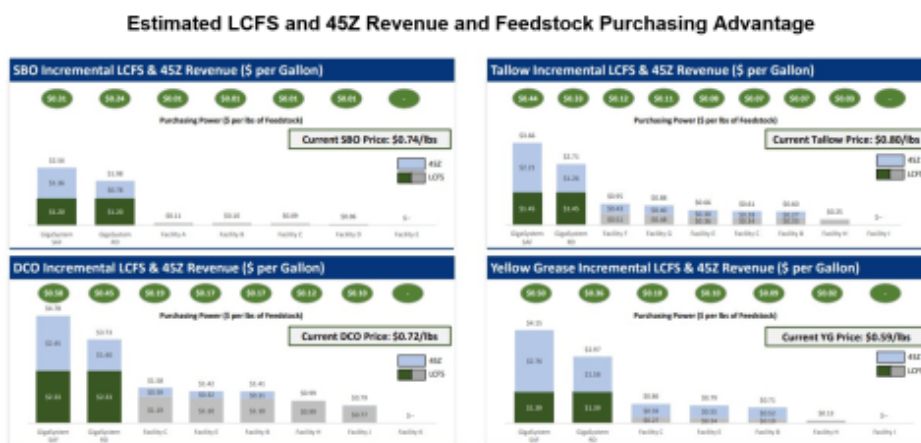


Figure 4. Estimated LCFS and 45Z Revenue and Feedstock Purchasing Advantage. Source: Fidelis New Energy

As feedstock demand increases and prices begin to rise, producers of low-CI fuels should have a significant advantage over retrofit producers thanks to their larger margins, a product of the BTC, California's LCFS and the coming addition of the 45Z tax credit. As a result, low-CI producers should have a significant revenue and purchasing advantage and the ability to outbid competitors for the feedstocks they need, especially if feedstock prices move higher. Figure 4 shows how that could play out. Each of the four sections shows the estimated advantages for four basic feedstocks (soybean oil, or SBO; tallow; distillers corn oil, or DCO; and yellow grease), with the light-blue sections of each bar reflecting contributions from the 45Z tax credit and the green/gray sections reflecting contributions from California's LCFS. When looking at soybean oil (top-left quadrant), a low-CI producer would be able to secure feedstocks at attractive margins even if prices were to rise high enough to shut in all other competitors.

Other Provisions

A few other important items of note about the IRA's passage and the 45Z tax credit.

- Does the 45Z tax credit expire? While the credit is scheduled to run from 2025-27, it could be extended in the same way the current BTC has been extended six times for a total of 13 years (including the two-year extension in the IRA through 2024).
- The new tax credit only applies to SAF or RD produced in the U.S., meaning companies with overseas RD/SAF production currently receiving the \$1/gal BTC would not be eligible to receive the 45Z tax credit once it comes into effect January 1, 2025.
- Producers stand to benefit from the 45Z tax credit as long as the RD or SAF is made in the U.S., but it doesn't have to be sold there, which could open the door to greater exports.
- What about carbon capture? The IRA boosts the 45Q tax credit for carbon capture, as we noted in *Way Down in the Hole*, Part 11, but a facility is not eligible to collect the 45Q and 45Z tax credits simultaneously.
- Are there strings attached? Just like other parts of the IRA, the full credit rates under 45Z only apply when certain prevailing wage and apprenticeship requirements are met.

There are national and state policies already in place to incentivize RD and SAF, but the transition to the 45Z tax credit has the potential to materially change the way the fuels are produced, how feedstocks are secured and priced, and production economics.

"Thunderstruck" was written by Angus and Malcom Young and appears as the first cut on side one of AC/DC's 12th studio album, *The Razors Edge*. Released as a single in September 1990, the song went to #5 on the Billboard Mainstream Rock Singles chart and has been certified Platinum by the Recording Industry Association of America (RIAA). Angus Young has stated that the song started with his riff and was developed with his brother Malcom for the rhythm part of the song. The tune -- whose key lines include "I looked 'round and knew there was no turning back" -- has been featured in several films and is used prominently at Dallas Cowboys football and Oklahoma City Thunder basketball games. Personnel on the record were: Brian Johnson (lead vocals), Angus Young (lead guitar), Malcom Young (rhythm guitar, backing vocals), Cliff Williams (bass, backing vocals), and Chris Slade (drums, percussion).

The Razors Edge was recorded during 1990 at Windmill Lane in Dublin and Little Mountain Sound in Vancouver, with Bruce Fairbairn producing. Released in September 1990, it went to #2 on the Billboard 200 Albums chart and has been certified 5x Platinum by the RIAA. Four singles were released from the LP.

AC/DC is an Australian rock band formed in Sydney in 1973 by brothers Angus and Malcom Young. They have released 18 studio albums, three live albums, two soundtrack albums, one EP and 48 singles and have sold more than 200 million records worldwide. Twenty members have passed through the band's ranks since its beginning, AC/DC was inducted into the Rock and Roll Hall of Fame in 2003. Singer Bon Scott died in 1980 and guitarist Malcom Young died in 2017. There has been no official statement on the future of AC/DC since the November 2020 release of the *Power Up* album, which was dedicated to Malcom Young.

