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PLAYIN' BY THE RULES - REGULATIONS SPARK A BEVY OF U.S. RENEWABLE DIESEL PROJECTS

December 5, 2019

Production of alternative, non-petroleum-based fuel continues to be a hot topic around the globe as government policies have incentivized or even mandated these products with the aim of reducing greenhouse gas emissions. In the U.S., we've seen waves of ethanol and biodiesel enter the fuel supply chain, but the latest commodity that has piqued industry interest is renewable diesel, whose chemical characteristics make it a particularly desirable replacement for conventional distillate. Today, we provide an overview of the renewable diesel market, the legislative programs in North America that are incentivizing its production, and the projects currently on the books to produce it.

What Is Renewable Diesel?

Renewable diesel is similar to biodiesel in that it can be produced from lipids — typically vegetable oil, waste cooking oil, animal fats, etc. However, the production processes for the two fuels are different, leading to important differences in their chemical structures. Renewable diesel is most commonly produced through hydrotreating the feedstock, while biodiesel is produced through transesterification, a process that turns the lipids into fatty acid methyl esters (FAME) — and a great word to remember for Scrabble. We won't bog you down with a complex description of those two processes, but the important thing to remember is that each of the resulting fuels has distinct properties that allow them to be blended differently with petroleum-based diesel. Biodiesel is subjected to lower blending limits (typically 5-20%; lower in colder climates) due to its cold-flow properties — i.e., its flow behavior at low temperatures — that can lead to plugging, or restricted flows, in vehicle fuel systems. By contrast, renewable diesel is chemically similar to petroleum-based diesel and can therefore be used as a direct “drop-in” substitute that is not subject to similar blending limits.

Regulatory Programs

Renewable diesel production and consumption are expected to grow significantly over the next few years due to increasing legislative requirements, including the U.S. Renewable Fuel Standard (RFS); the Low Carbon Fuel Standard (LCFS) in California, Oregon and British Columbia; and the newly proposed Canadian Clean Fuels Standard (CCFS).

Renewable Fuel Standard

As we said in a blog series on the topic a few years back, the RFS program was created under the Energy Policy Act of 2005 and expanded under the Energy Independence and Security Act (EISA) of 2007; the program is overseen by the Environmental Protection Agency (EPA). Under the RFS, refiners and gasoline importers are required to sell specific volumetric target quantities (known as Renewable Volume Obligations, or RVOs) of renewable fuel each year, as laid out in EISA. RVOs under the RFS are steadily increasing, with biomass-based diesel, which includes the majority of renewable diesel, projected to increase by 330 million gallons per year (MMgal/year) in 2020 to 2.43 billion gallons per year (Bgal/year) (yellow oval in Figure 1). To show compliance with the RFS, a refiner or importer can either blend higher amounts of biofuels to generate the renewable identification numbers (RINs) or purchase RINs from others.



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[A quick aside on RINs for those who aren't familiar with them. RINs are a regulatory mechanism for both tracking the production and blending of renewable fuels and for enabling refiners and importers to prove they've met their RVO mandates and thereby avoid paying hefty fines to the feds. As we said in [Money for Nothing](#), a RIN is created when a gallon of biofuel (ethanol, biodiesel, renewable diesel etc.) is manufactured. Once that biofuel is blended with gasoline or diesel for sale in the U.S., the RIN becomes "detached" from the biofuel, and two things can happen: (1) it can be surrendered to the EPA by an obligated party (a refiner or importer) to demonstrate compliance with the RFS, or (2) if a non-obligated party (i.e., someone who didn't manufacture or import the gasoline or diesel) generates the RIN, they can sell it to obligated parties who then surrender it to the EPA to meet their obligation.]

Renewable diesel allows refiners/blenders to generate RINs at a higher rate, since renewable diesel has a higher RIN-equivalent value of 1.6-1.7 versus biodiesel at 1.5 or ethanol at 1.0, and can also be blended in higher percentages due to its chemical structure. (As for a definition of "RIN-equivalent value," let's just say it's an equation in the RFS regulations that attempts to measure the benefits of a renewable fuel to the environment.)

Final Volume Requirements for 2017-20

	2017	2018	2019	2020
Cellulosic biofuel (million gallons)	311	288	418	n/a
Biomass-based diesel (billion gallons)	2.0	2.1	2.1 ^b	2.43
Advanced biofuel (billion gallons)	4.28	4.29	4.92	n/a
Renewable fuel (billion gallons)	19.28	19.29	19.92	n/a
Notes:				
^a All values are ethanol-equivalent on an energy content basis, except for BBD which is biodiesel-equivalent.				
^b The 2019 BBD volume requirement was established in the 2018 final rule (82 FR 58486, December 12, 2017).				

Figure 1. RFS Final Volume Requirements for 2017-20. Source: Environmental Protection Agency

Renewable Diesel Projects

The current demand for renewable diesel in the U.S. is met from production by a number of facilities in the U.S. Gulf Coast and Midwest regions with a combined capacity of 356 MMgal/year (dark blue layer at bottom of stack in Figure 3), or by imports (Figure 2), most of them from Singapore, Germany and Canada. As of today, all imports of renewable diesel into the U.S. have been destined for the West Coast, where fuel suppliers can double-dip on RINs and LCFS credits. Canada has also imported



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renewable diesel into both its East Coast (from Europe) and West Coast (from Singapore).

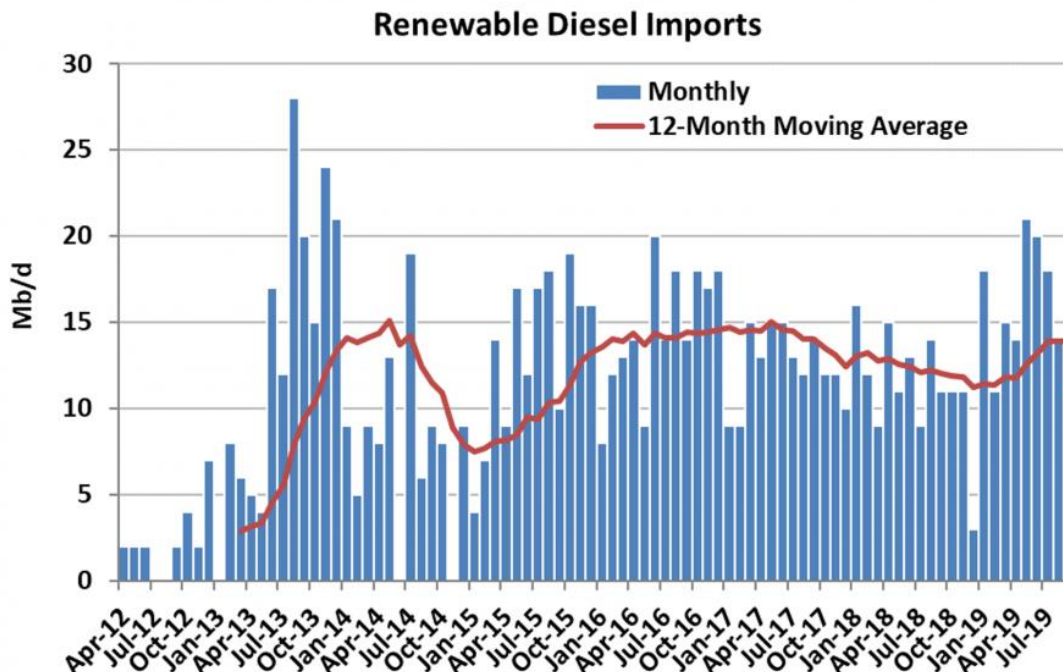


Figure 2. U.S. Imports of Renewable Diesel. Source: Energy Information Administration

With demand for renewable diesel projected to grow due to the regulatory requirements, renewable diesel production capacity in the U.S. is set to expand significantly over the next few years. A review of announced projects suggests that renewable diesel capacity could expand by a factor of eight to about 2.9 Bgal/year by 2024 (combined layers in stack in Figure 3) — an extraordinary growth rate by any standard. Note that this capacity does not include projects (1) that failed to specify their capacity, or (2) that involve the “co-processing” of small amounts of vegetable oils or animal fats with crude oil in traditional refining. Interestingly, the majority of the new capacity planned is through partnerships with refining companies. For example, Valero, Shell and Phillips 66 (P66) have partnerships with other companies for new renewable diesel facilities, primarily on the Gulf Coast and West Coast.



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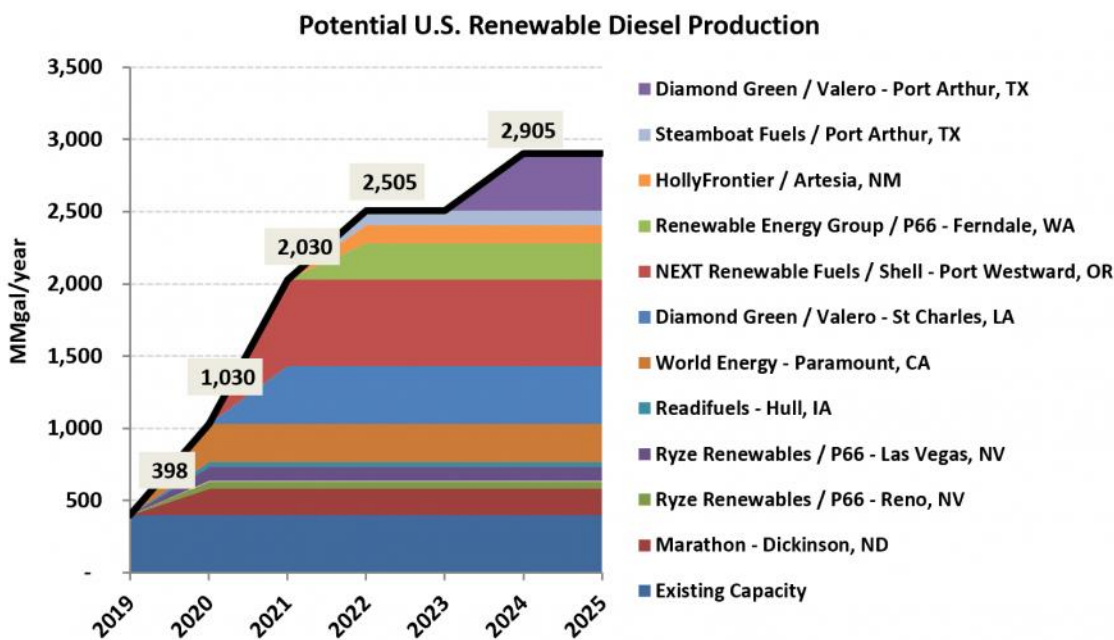


Figure 3. Potential U.S. Renewable Diesel Production Capacity. Source: Baker & O'Brien (Notes: The World Energy project includes some renewable jet fuel capacity. Also, the colored stack does not include projects where capacities have not been announced, such as those by PBF Energy, Readifuels and Emerald Biofuels.)

On one hand, it's important to note that even with this impressive build-out in renewable diesel capacity, the combined capacity of all the existing and planned production facilities would produce volumes equal to 4% of total U.S. diesel supplied — that is, conventional, oil-based diesel fuel still would account for the vast majority of the fuel consumed by diesel-powered cars, buses and trucks. On the other hand, some envision far greater market penetration by renewable diesel in the 2020s. Earlier this year, California's governor called for replacing 100% of the oil-based diesel consumed in the state with a blend of renewable diesel and biodiesel by 2030.

Note: The article was authored by Amy Kalt of Baker & O'Brien and published on RBN Energy's Daily Energy Post on December 5, 2019.

"Playin' by the Rules" was written by Michael McDonald and Ed Sanford. It appears as the first track on Michael McDonald's debut solo album, If That's What It Takes.

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