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Renewable Diesel's Advantages Put It in the Driver's Seat

Why RD is on the rise, and how refiners are adapting their plans



- Low Carbon Fuel Standards, which aim to reduce greenhouse gas emissions in the transportation sector, are relatively new but their use is spreading.
- LCFS programs may differ by jurisdiction, but they generally are based on the carbon intensity, or CI, of various fuels, and call for increasing the use of lower-CI fuels over time.
- Renewable diesel provides a lower-carbon, renewables-based alternative to petroleum-based diesel, and is also a drop-in replacement for ultra-low sulfur diesel. Unlike another biofuel, ethanol, it has no “blend wall.”
- California’s LCFS is one of the longest-running programs for carbon intensity reduction and provides an ideal case study for understanding how one type of GHG-reduction policy can work.
- Refiners have been investing heavily in renewable fuels production, such as renewable diesel and ethanol, and in sourcing more of their electricity needs from wind and solar.

1. Introduction

As part of the Paris Agreement and other sustainability goals, countries across the globe are formulating strategies to reduce greenhouse gas emissions (GHG). The resultant policies target numerous different areas such as stationary emissions, electricity production, and transportation fuel sourcing. Within the transportation sector, one aspect that has spurred quite a bit of investment relates to reducing the carbon intensity (CI) of transportation fuels. The “low-carbon fuel” policies that are in place today, coupled with those that are being evaluated for the future, have the potential to displace a sizeable portion of the petroleum-based fuels in the jurisdictions where they are adopted.

Emission-reduction policies can cover a broad list of targets — everything from fossil-fired power plants, industrial facilities, and landfills to commercial buildings, home heating, and fuel usage in cars, trucks, buses, and railroads.

From a regulatory perspective, the goal of reducing GHG emissions from the consumption of on-road transportation fuels can be addressed several ways. Here are some of the more popular approaches:

- **Fuel Economy Standards:** With tighter fuel standards, manufacturers are required to increase the efficiency of their vehicles, which results in lower fuel usage per distance traveled. In the U.S., for example, Corporate Average Fuel Economy (CAFE) regulations mandate certain levels of fleetwide fuel economy based on the category of vehicle (i.e., light-duty vehicles, heavy-duty vehicles, etc.).
- **Renewable Blending Requirements:** Some governments require that certain proportions of transportation fuels come from renewable sources, such as ethanol and biodiesel. Key to the efficacy of these policies in reducing the sector's overall emissions is that the renewable fuels are produced from sources with lower life-cycle GHG emissions.
- **Zero Emission Vehicle Mandates:** These types of efforts, which typically require that a certain proportion of the vehicles sold be fully or partly powered by electricity, are becoming increasingly popular across the globe, including in the U.S., the European Union (EU), and China.
- **Low Carbon Fuel Standards (LCFS) or Clean Fuels Policies:** These policies are relatively new, but their use is spreading. GHG emission reduction is the core goal of low-carbon programs. They are generally based on the CI of various fuels and on shifting to lower-carbon fuels over time.

To meet GHG emission-reduction goals, the production of alternative, non-petroleum-based fuel continues to be a hot topic as government policies have incentivized or even mandated these products. 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.

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.

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 be used as a “drop-in” substitute that is not subject to similar blending limits.

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; LCFS programs in California, Oregon, and British Columbia; and the newly proposed Canadian Clean Fuels Standard.

In this Drill Down Report, which is based in large part on work by our friends at **Baker & O'Brien**, we will examine low-carbon fuel policies, with a particular focus on renewable diesel, including

how it is made, the advantages it holds over biodiesel, and its potential impacts on refiners and the overall transportation fuels market.

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