PETROLEUM WATCH

CALIFORNIA ENERGY COMMISSION

INSIDE

REFINERY NEWS

- **Marathon Los Angeles:** On May 14, a power outage occurred that resulted in emergency flaring according to California Office of Emergency Services and South Coast Air Quality Management District.
- **Chevron Richmond:** On May 28, union workers on strike voted to ratify the Chevron contract, ending the ten-week strike according to Reuters.

CALIFORNIA GASOLINE RETAIL PRICES BY BRAND

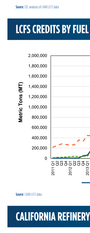
May 2022 vs. 2021	
(Percentage Change)	
76	46% higher
ARCO	46% higher
Chevron	44% higher
Hypermart	46% higher
Shell	44% higher
Unbranded	45% higher
Valero	45% higher
May 2022 Averages	
76	$6.03
ARCO	$5.76
Chevron	$6.23
Hypermart	$5.54
Shell	$6.14
Unbranded	$5.77
Valero	$5.93

CALIFORNIA DIESEL RETAIL PRICES BY REGION

May 2022 vs. 2021	
(Percentage Change)	
Northern CA	60% higher
Central CA	63% higher
Southern CA	60% higher
May 2022 Averages	
Northern CA	$6.48
Central CA	$6.35
Southern CA	$6.45

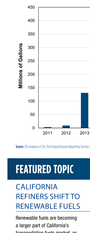
Source: EC analysis of OPIS data.

CALIFORNIA DIESEL CONSUMPTION



Source: California Air Resources Board (CARB) Low Carbon Fuel Standard (LCFS) and California Department of Tax and Fee Administration (CDTFA) data.

LCFS RENEWABLE DIESEL FEEDSTOCKS



Source: EC analysis of CARB LCFS data.

LCFS CREDITS BY FUEL TYPE

Source: CARB LCFS data.

CALIFORNIA REFINERY DIESEL PRODUCTION

Source: EC analysis of Energy Information Administration (EIA) and Petroleum Industry Information Reporting Act (PIIRA) data.

RENEWABLE DIESEL IMPORTS TO CALIFORNIA

Source: EC analysis of U.S. Port Import/Export Reporting Service (PIERS), and California State Lands Commission (CSLC) data.

FEATURED TOPIC

CALIFORNIA REFINERS SHIFT TO RENEWABLE FUELS

Renewable fuels are becoming a larger part of California's transportation fuels market, as shown by announcements to invest in renewable fuel production made by several California petroleum refineries. This shift to renewable fuels is being driven by government incentives. According to the EIA, renewable diesel production capacity could represent 25 percent of total diesel production on the West Coast by 2024. This Petroleum Watch focuses on renewable diesel production emerging from petroleum refineries.

RENEWABLE FUEL

Renewable fuels are different than fossil fuels in that they are made from renewable resources. Most renewable fuels are produced through a combination of chemical and materials feedstocks. Examples of renewable fuels that support internal combustion engines include ethanol, biomethane, biodiesel, and renewable diesel.

Ethanol is mixed with gasoline and helps a car's engine burn more efficiently. Biomethane is chemically the same as natural gas and can be used for electricity production and heating. Biodiesel and renewable diesel are substitutes for petroleum diesel; however, they are two distinct products. While they both produce low emissions, only renewable diesel is chemically equivalent to petroleum diesel and can be used in any concentration in a diesel engine. Biodiesel can only be mixed up to 10 percent with petroleum diesel because in higher concentrations it can cause problems in engines and may void vehicle warranties. According to Neste, the world's largest producer of renewable diesel, benefits of renewable diesel include that it withstands cold and storage much better than biodiesel, is higher quality for the engine, and provides the greatest reduction in air emissions.

While there is growth occurring in the biodiesel market, renewable diesel is one of the fastest growing low-carbon fuels in California's transportation fuels market. California Diesel Consumption shows consumption by type in California. Consumption of renewable diesel reached record levels of more than 937 million gallons consumed in 2021, representing 25 percent of total diesel consumption in California.

MAKING THE TRANSITION

Petroleum refineries make ideal locations for renewable fuels facilities. Processes used to produce petroleum fuels, such as hydrotreating, are similar to processes used for production of renewable fuels. A conversion is faster and more cost effective than building a brand-new renewable fuels facility because it ensures usage of existing equipment, existing expertise of operations and maintenance, and reduced permitting requirements.

The Refineries

There are four refineries in California that are transitioning to renewable fuels. Current and Proposed California Renewable Fuels Production Capacity shows the capacities of the four refineries.

- Marathon Petroleum Martinez: Previously a petroleum refinery that accounted for roughly 9 percent of California's crude oil processing capacity, it ramped down operations in April 2020 due to COVID-19. In August 2020, the refinery announced the indefinite idling and plans to idle the facility's crude and storage capacity as a terminal to supply other refineries and operations to convert to renewable fuel facility are complete. Marathon expects to start producing renewable diesel in 2022, reaching full capacity in 2023 of 730 million gallons per year of renewable fuels. The Contra Costa Board of Supervisors approved the project on May 3, 2022.
- Phillips 66 Rodeo: Announced plans in August 2020 to produce 680 million gallons per year of renewable diesel, gasoline, and jet fuel. Combined with the production of renewable fuels from an existing project, the facility would produce more than 800 million gallons per year of renewable fuels. Once configured, production is expected to begin in 2024. The Contra Costa Board of Supervisors approved the project on May 3, 2022.
- AEMI Paramount: A subsidiary of World Energy, has been operating since 2016 at a capacity of 3,500 barrels per day or roughly 56.1 million gallons per year. The former petroleum refinery has completed projects to convert it to a renewable fuels facility capable of producing renewable diesel, gasoline, and jet fuel. The plan to increase capacity to a total of 151 million gallons per year with the project expected to be complete in the first quarter of 2024.
- Global Clean Energy Holdings Bakersfield: Owns Bakersfield Renewable Fuels, who is leading the conversion to renewable diesel production. The facility will produce renewable diesel at a full capacity of 230 million gallons per year. The facility is expected to be operational this year.

Per Feedstock

Renewable diesel shares the same oil, oil, and grease feedstocks as biodiesel. California Air Resources Board's (CARB) LCFS Renewable Diesel Feedstocks shows quarterly data on the feedstocks used which includes used cooking oil, tallow (beef fat), distiller's corn oil, fish oil, and other which consists of predominantly soy in 2020 and 2021. As of 2021 Q4, used cooking oil was the leading feedstock. For total volumes in 2021, used cooking oil (UCO) was used the most totaling roughly 287 million gallons, followed by other predominantly soy totaling 201 million gallons, then tallow totaling 147 million gallons, and finally corn oil totaling 143 million gallons.

With the impending increase in renewable diesel capacity, feedstock availability becomes a concern as renewable fuels producers compete to secure supply. Demand for feedstock raw materials is increasing and driving prices higher. Ultimately, it's difficult to predict what will be imported as renewable diesel production is in its early stages and there are potentially many sources of raw materials.

INCENTIVES

To reduce a transportation fuel's lifecycle greenhouse gas emissions, referred to as carbon intensity (CI), reduce petroleum dependency and reduce air emissions, governments have created policies to incentivize the production of renewable fuels. There are two main policies driving California refineries to make the switch, the United States Environmental Protection Agency's Renewable Fuel Standard (RFS) and CARB's Low Carbon Fuel Standard (LCFS).

The RFS is a national policy that requires a certain volume of renewable fuel to replace or reduce the quantity of petroleum-based transportation fuel, heating oil, or jet fuel. Renewable diesel is used to comply with the renewable volume obligations for biomass-based diesel in the RFS.

To meet CARB's LCFS, providers of transportation fuels are required to meet the standards set for each year. The LCFS commands each fuel's CI by a declining CI benchmark for its petroleum-based version. Fuels below the benchmark generate credits, while fuels above the benchmark generate deficits. LCFS credits generated by renewable diesel providers have some of the lowest CI scores. Looking at LCFS Credits by Fuel Type, renewable diesel received more credits than ethanol or biodiesel. In 2021, renewable diesel achieved a total of 6.5 million metric tons of carbon dioxide equivalent, followed by ethanol at 3.8 million metric tons, and biodiesel at 2.3 million metric tons.

OUTLOOK ON RENEWABLE FUELS

Adding renewable diesel capacity to the current diesel supply in California could relieve some pressure when diesel prices are high due to the cost of crude oil. California diesel production has declined over the last couple years, likely due to the demand destruction caused by COVID-19 and the subsequent shut down of Marathon Martinez refinery. Referencing data from 2019, Marathon Martinez made up 14 percent of California's diesel production before they shut.

Based on the data provided in the California Refinery Diesel Production graph, total diesel production has declined since 2019, with a roughly 1.7 million gallon per day decrease in 2020 when compared to 2019 production levels, and a roughly one million gallon per day decrease in 2021 when compared to 2020 production levels.

The added proposed capacity for renewable diesel, which is a direct substitute for petroleum-based diesel, is roughly 2 billion gallons per year by 2024. This is equivalent to 36 percent of 2019 total diesel production comparison made to pre-COVID production). Adding the 2024 proposed renewable diesel capacity to 2021 petroleum diesel production equals roughly 6.6 billion gallons per year of total diesel. This is about one billion gallons more per year than 2019 diesel production (pre-COVID). However, it is important to note that Phillips 66 Rodeo will no longer produce crude and once renewable fuel production begins, which will bring the total diesel production lower.

All renewable diesel imports to California come via marine tanker. Renewable Diesel Imports to California graph shows that renewable diesel marine imports reached record high levels in 2021 at 383 million gallons. Renewable diesel marine imports come almost exclusively from Singapore because Neste's renewable diesel refinery is located there, and it is the closest source to California. According to the EIA, since 2014, all renewable diesel imports have entered the United States through California. While renewable diesel production will increase in California, imports may remain high as producers are eligible for credits if the fuel is sold within the state. Until similar government programs are matured or implemented in other states (for example, Washington, Oregon, Arizona), California will continue to see high demand of renewable diesel imports.

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