

Argus White Paper: Renewable feedstocks present new and complex opportunities



The global refining industry is increasing production of renewable fuels for the transportation market. This means renewable feedstocks — whether crop-based or waste-based — are flooding into markets that were once reserved for petroleum products.

Covid-19 has sharply decreased transportation fuel demand, even as government mandates calling for increased use of renewable fuels in the US and Europe have refiners and producers re-prioritizing refinery utilization.

With that comes the need for price discovery and market intelligence across the entire renewable fuels supply chain. Argus provides pricing and market commentary for renewable feedstocks, finished renewable fuels and renewable fuel credits and tickets in the US and Europe. Argus is the industry benchmark for biofuels in Europe and is ideally poised to be the leader in renewable feedstocks and finished fuels market intelligence and pricing in Europe and the US.

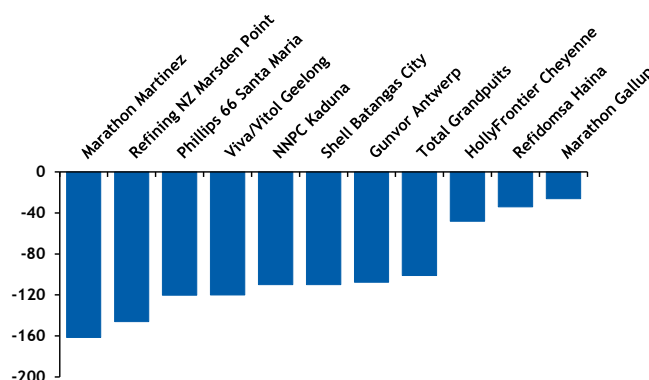
Argus adds renewable fuels pricing, keeping pace with US production shift

As efforts to slow the spread of Covid-19 this year have diminished transportation fuel demand for gasoline, jet fuel and diesel, refiners across the globe have begun shuttering or repurposing capacity (see chart). In the US, lucrative federal and state-level incentives and Low Carbon Fuel Standard (LCFS) programs have refiners shifting production away from petroleum capacity and toward renewable fuels. These fuels include renewable diesel, biodiesel, sustainable aviation fuel, naphtha and renewable natural gas.

Many US west coast refiners are repurposing capacity for renewable diesel output. So far, US west coast refiners have generally stayed out of the renewable diesel production game, leaving renewable diesel supplies to Gulf coast refiners. Louisiana hosts 70pc of renewable diesel capacity and Texas supplies 15pc of biodiesel capacity. Instead, the US west coast imports its renewable diesel primarily from Finnish refiner Neste's 1.3mn t/yr Singapore refinery.

However, a shift is afoot. West coast refiners, including Phillips 66 and Marathon Petroleum, plan to convert refining capacity from petroleum production to renewable diesel.

Covid-19 related refinery closures



Phillips 66 will convert its San Francisco refining complex to produce 52,000 b/d of renewable fuels (renewable diesel, naphtha and jet fuel) over the next three years, making it the largest renewable fuels production site in the US. Marathon Petroleum is considering plans to convert its idled refinery in Martinez, Calif., to a 48,000 b/d renewable diesel plant in 2022. Smaller refiners, including HollyFrontier (Wyoming) and CVR Energy (Oklahoma) also have conversion projects underway to add renewable diesel production.

Renewable diesel is chemically identical to petroleum diesel, so assets associated with a refinery, including pipelines, storage tanks and other transportation vehicles do not need converting, unlike other biofuels such as ethanol and biodiesel. This reduces the barrier to entry into the renewable diesel market for refiners.

With renewable diesel production plans comes the need for renewable feedstocks supplies. Renewable diesel is produced from hydroprocessed plant and animal fats, vegetable oil and used cooking oil (UCO) (see chart). Many industries, including farming and restaurants, sell into the renewable feedstocks pool.

The Argus America Biofuels report publishes 30 daily renewable feedstock price assessments in the US, reflecting the growing importance of verifiable and insightful pricing tools in the renewable fuels market. These assessments are based on spot market activity in locations across the country and fall under seven categories of renewable feedstocks that are all used in the production of renewable diesel and biodiesel: used cooking oil (UCO), bleached fancy tallow,

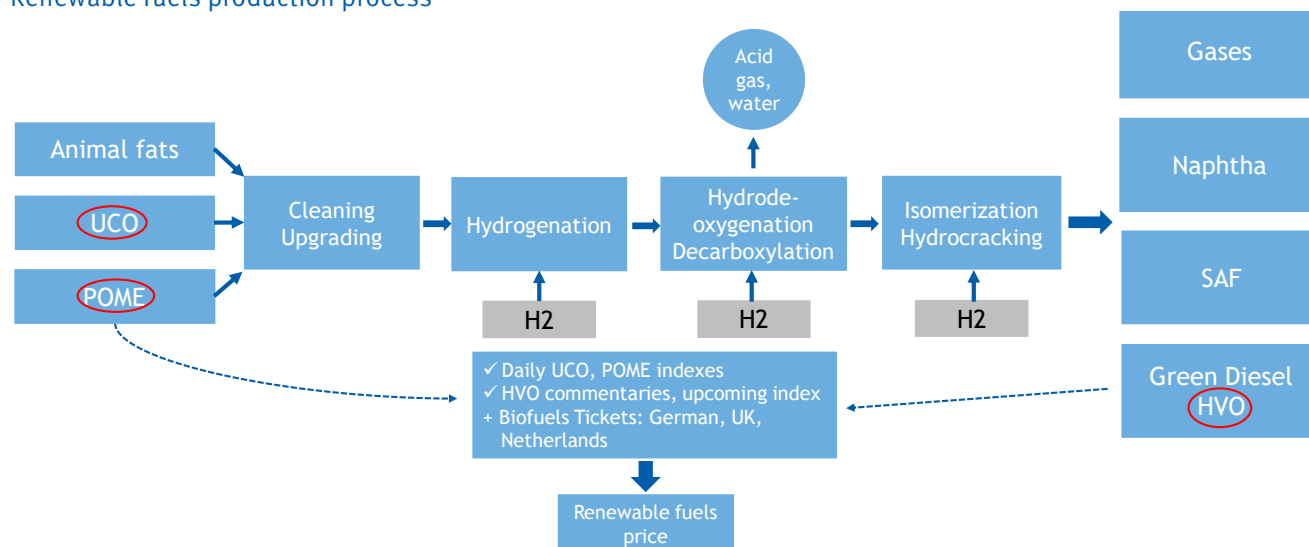
yellow grease, choice white grease, crude degummed soybean oil, distiller's corn oil and poultry fat.

State and federal incentive and blending credit programs in addition to the relative ease of refinery conversion have refiners keenly interested in moving into renewable diesel production. A US federal tax credit extended through 2022 offers a \$1/USG incentive for each renewable diesel or biodiesel gallon blended into the US transportation supply. Renewable diesel also generates 1.7 credits used to comply with federal blending mandates from the Renewable Fuel Standard (RFS) compared to 1 credit per gallon for ethanol and 1.5 credits per gallon for biodiesel. In addition to the \$1/USG incentive and credits generated under the RFS, renewable diesel and sustainable aviation fuel also generate credits under California's LCFS.

The US renewable fuels supply environment will look drastically different by the end of 2024 as announced refinery conversions come online. By 2021, the US west coast will host more than 60pc of the country's new renewable diesel production. By the end of 2024, the west coast will produce 56pc of US renewable diesel (2bn USG/year), displacing the US Gulf coast as the renewable diesel production epicenter.

The west coast has long been a focus for renewable fuel markets because of increasingly stringent carbon intensity (CI) targets under the region's LCFS programs. California, in particular, is the pioneer in renewable fuels mandates and incentive programs, and other states are following suit. Oregon has its Clean Fuels Program, which will tighten targets over the next few years, necessitating greater use

Renewable fuels production process



of renewable fuels. Washington and New York are planning to enact LCFS programs, which will also increase renewable diesel use over the next decade.

Renewable diesel is used to meet the requirements set by California's LCFS because of its attractive CI, or greenhouse gas reduction score. The US imports nearly 30,000 b/d of biomass-based diesel, primarily renewable diesel. All imports ship into California to meet the LCFS mandates. The California LCFS requires a 20pc reduction in the CI of transportation fuels from the 2010 baseline by 2030. This year's target is an aggressive 7.5pc cut. As the CI targets for the California LCFS get more stringent over the next decade, the use of more renewable fuels will become necessary, including renewable diesel, renewable natural gas, biodiesel and ethanol. Renewable diesel and ethanol are the top credit generators under the LCFS program, making renewable diesel and its feedstocks highly sought after. Renewable diesel imports are expected to have increased by 25pc in 2020 and 56pc in 2021, giving US refiners even more incentive to increase domestic production. California LCFS prices, which have risen over the past few years, are attractive to renewable fuel producers. Prices have recovered from their Covid-19 pandemic-induced drop and sit just below \$200/t, according to *Argus* assessments.

Even as California's targets get more stringent, clean fuels programs in Canada and other states across the US are set to come into effect, adding more competition to the already tight renewable fuels and feedstocks markets. Demand for renewable feedstocks is expected to significantly rise over the next 10 years because of planned renewable fuel projects and clean energy programs. These programs have been largely insulated from Covid-19 demand loss, as compliance with the programs will become mandatory for refiners and importers regardless of transportation fuel demand cycles.

British Columbia will extend its LCFS program to 20pc by 2030, and Oregon is working to extend to 25pc by 2035. Canada plans to slash GHG emissions by 30mn t/yr by 2030, and the liquid fuel portion of its proposed Clean Fuel Standard will begin in 2022. Within Canada's program, ethanol, biodiesel and renewable diesel should be significant credit generators.

Efforts are underway in New York and Washington to add state-level LCFS programs, and the Great Plains Institute is proposing a US midcontinent regional LCFS program. US Senate Democrats are calling for a national clean energy mandate and LCFS program to reduce US GHG emissions.

Argus expanded its California LCFS assessments in March to include spot delivery during the first four forward calendar quarters. *Argus* also publishes a daily Oregon LCFS market assessment, and market coverage includes premiums for ethanol, biodiesel, sustainable aviation fuel and compliance costs for gasoline and diesel.

As EU blending mandates drive demand, Argus responds with HVO, SAF assessments

In Europe, mandates under the Renewable Energy Directive II (RED II) are also growing more stringent and are driving demand for low carbon biofuels. The current EU-wide target of renewables in final energy consumption is set at 32pc by 2030, with a separate 14pc target for renewables in transport. Now, the European Commission has proposed a 55pc GHG emissions cut by 2030, meaning the EU will have to achieve a renewable share of 38-40pc in final energy consumption and a 24pc share in transport. Most member states within the EU have already proposed additional renewable fuels mandates, significantly boosting demand for renewable fuels and feedstocks.

European refiners are increasing domestic renewable fuel and biofuels production, and Europe is also turning to China and other Asia-Pacific countries for renewable fuel and feedstocks imports. In 2018, the EU imported more than 250,000t of FAME biodiesel from China. In January 2019, China sent more than 30,000t of UCO into Europe, the most of any other country.

European hydrotreated vegetable oil (HVO) renewable diesel production is expected to increase to 7mn t/yr in 2020-2021. HVO plants typically process a mix of crop-based and waste-based feedstocks. HVO can be blended into the existing diesel pool and is an important factor in meeting RED II mandates. Neste pioneered the renewable diesel production process, but competitors are quickly coming to market.

A benefit to HVO production is that refineries are not limited to one type of renewable feedstock but can easily switch to the most price competitive source. At the height of the Covid-19 pandemic when restaurant closures across the globe reduced the availability of UCO as a feedstock to renewable fuels producers, soybean oil became the renewable feedstock of choice for many plants. But feedstocks such as UCO or tallow can be double counted against energy mandates across most EU member states and boast higher GHG savings, which will keep them as the preferred choice for HVO producers.

With renewable feedstocks flexibility comes a challenge in pricing the finished fuels markets and normalizing market specifications. *Argus Biofuels*, the industry benchmark in Europe, offers sought-after transparency and clarity to the complex renewable fuels and feedstocks markets. *Argus* launched weekly HVO assessments for northwest Europe that cover three different groups of feedstocks: food and feed crops, used cooking oil/palm oil mill effluent and tallow. These price assessments are published weekly in the *Argus Biofuels* report, with real-time market pricing available directly on *Argus'* price discovery platform, *Argus Open Markets* (AOM).

Argus also added a weekly sustainable aviation fuel (SAF) assessment to its *Argus Biofuels* and *Argus Jet Fuel* reports to meet the growing need for transparent pricing in the emerging renewable jet fuel market. RED II and global airline industry directives are pushing airlines to use more renewable fuels. Like HVO and renewable diesel, SAF is made from waste products, such as UCO. Pressure on airlines to reduce the carbon footprint of their operations is intensifying despite the economic uncertainty the airline industry has faced since the Covid-19 pandemic shattered passenger demand. Some airline bailouts by governments, notably those of Air France and Scandinavian carrier SAS, have been explicitly linked to requirements to reduce carbon emissions, boosting the need for SAF despite passenger demand erosion.

In Europe, *Argus* assesses the cost of compliance with EU biofuels blending mandates in the UK, Germany and the Netherlands by following the respective biofuels ticket markets. The purchase of biofuels tickets is the most commonly used alternative to physical biofuels blending, and the weekly publication of respective ticket values offers market participants further transparency by completing the overview of the main European biofuels markets.

Renewable fuels could be a key to survival

As navigating the Covid-19 pandemic has challenged so many industries, the global refining industry is discovering that moving deeper into the renewable fuels space is a timely option to stay afloat in the post-pandemic world. Steep government mandates and decreased consumer demand at one time spelled disaster for some refiners. However, a shift into the renewable fuels sector could be a must for refiners to survive as fossil fuel demand decreases. And as renewable fuels and feedstocks demand grows, so will the need for transparency to illuminate those markets.

Who is Argus?

Argus is an independent media organisation headquartered in London and has offices in each of the world's principal commodity centres. It is headquartered in London and has offices in each of the world's principal commodity centres. Its main activities comprise publishing market reports containing price assessments, market commentary and news, and business intelligence reports that analyse market and industry trends.

Argus is a leading independent price reporting agency covering energy markets around the world. Founded in 1970, *Argus* reports on oil, coal, LPG, natural gas, emissions, metals, power, petrochemical, fertilizer markets, agriculture, as well as freight and other transport issues.

Argus has offices globally, including London, Houston, Washington, New York, Calgary, Rio de Janeiro, Singapore, Dubai, Beijing, Tokyo, Sydney, Moscow, Astana and other key centres of the commodity industries. *Argus* was founded in 1970 and is a privately held UK-registered company.

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