

# Germany plans to create jet fuel from water

Scientists are developing a version of green kerosene to sustainably power the aviation and heating sectors.



The green kerosene being created is derived from water and pulls carbon dioxide out of the air during creation, but it requires lots of electricity to produce. The electricity is being generated from renewable resources. Getty

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The solution to flight-shaming may hinge on a modernized version of a synthetic jet fuel that was honed by Adolf Hitler's Luftwaffe.

German scientists and business leaders are working to create what they hope will be the first viable market for a carbon-neutral version of the kerosene that already powers most modern aircraft.

The science is still based on chemical reactions pioneered in Germany in 1925, but instead of converting coal and other fossil fuels like the oil-starved Nazis did during World War II, green kerosene is derived from water and actually pulls carbon dioxide out of the air during creation.

The process, which requires huge amounts of electricity generated from renewable resources to ensure carbon neutrality, fractures water into oxygen and hydrogen, which is then combined with carbon.

The project is being overseen by Bremen University, in a consummately German public-private research strategy that previously created the MP3. The German system, which the US is trying to emulate, aims to produce the green fuels required for sectors of the economy like aviation and heating that rely heavily on petroleum imports.

"Synthetic fuel is the only vision I can see right now to really become CO2 neutral in the conceivable future," Deutsche Lufthansa chief executive Carsten Spohr told a conference on sustainable aviation in the German capital in November.

While green kerosene releases carbon when burned, the process is neutral because it recycles greenhouse gas from the air and doesn't require more fossil fuels to be taken from the ground.

The German flag carrier is working with the consortium to supply what it expects will be 5 percent of its fuel within five years. The non-fossil kerosene is being made at closely held Klesch Group's Heide oil refinery near the North Sea, using renewable energy supplied by local wind farms.

Other countries, including Canada and the US, are already deploying Power-to-X technology to capture carbon dioxide and store it underground, but so far only in proof-of-concept ways that are too small to make a noticeable difference in the battle against climate change.

Carbon Engineering, a Canadian company partly funded by Bill Gates, has been producing "Air to Fuel" gasoline, diesel and kerosene since 2017, but not in major volumes due to costs, which are still several times more than petroleum-based products. The venture is one of a handful that Canada's government is supporting in the race to curb surging aviation emissions by developing the most economical and environmentally friendly fuel possible.

But it's Germany, where more than half of Europe's 130 Power-to-X testing plants are located, that is leading the charge. Public calls for action on climate change intensified following last year's record-breaking droughts and heatwaves, withering crops and swelling support for the environmentalist Green Party.

While power generation and farming currently dwarf aviation's around 2 percent of all human-caused greenhouse gases, skyrocketing emissions from air travel means the industry, which was exempted from the Paris 2015 climate agreement, will become the biggest single polluter if predicted cuts in other sectors materialize, UN data and projections show.

Tom Oliver, a professor of ecology at the University of Reading, said that while the economics of moving to low emission technologies like synthetic fuel was fearsome, the pressure to act is intensifying as more and more voters demand concerted action to counter the effects of climate change.

"We almost need a wartime footing to unlock the momentum and the significant state investment needed to catalyze the transformation of our socio-economic

systems,” Mr. Oliver said by phone from the UK.

Indeed, Germany’s government is already working on a strategy for scaling-up its “green hydrogen” push to produce synthetic fuels at more competitive prices. If Lufthansa gets its way, that effort will include channeling more of the government’s aviation tax into the project.

Increasingly onerous regulations demands from carbon-conscious customers and the spread of flight shaming are all adding to the pressure to develop cleaner fuels faster.

“All the technologies you need are currently deployed in other areas, so it’s just a question of making it practical and economical,” said Mr. Oliver.

The social-engineering tactic, which started in teenage environmental activist Greta Thunberg’s native Sweden, contributed to a 4 percent decline in that country’s passenger numbers last year as more people opted to travel by electric train. Operators of rail networks across Northern Europe, already the world’s most advanced green economy, have been adding overnight routes to capitalize on the trend.

A study by Brussels-based Transport & Environment found that converting all aviation fuel to non-fossil kerosene with currently available technology would cost between three and six times more than traditional jet fuel. Even without factoring in rising taxes on air travel that would lead to an increase in ticket prices of as much as 60 percent, the research group estimated.

But that’s not a deal-breaker, according to Ulf Neuling, a chemical scientist at the Hamburg University of Technology. Governments can help offset the added expense through subsidies, tax changes or other incentives and, unlike, biofuels, which turned out to be less environmentally friendly and affordable than once hoped, synthetic jet fuel is scalable, he said.

“All the technologies you need are currently deployed in other areas, so it’s just a question of making it practical and economical,” Mr. Neuling said. “It can be used in aeroplanes that are on order now.”

The amount of electricity needed for an electrolysis process that essentially recycles what’s already in the air is what makes these fuels relatively expensive —

for now. Other hurdles to cranking up production include adding further strain to grids at a time when coal plants are being shuttered and electricity use for battery-powered cars is rising.

German engineers have pointed to a future of vast solar parks in North Africa that could produce green fuels at competitive cost before they're shipped to Europe. Building them would cost billions. And then there's the nuclear option being floated by Rolls Royce Holdings, which is a manufacturer of both aircraft engines and small, modular reactors based on designs used in military submarines.

Rolls Royce chief executive Warren East said just last month that coupling reactors to electrolysis units would "provide a very competitive solution" to the price issue.

To be sure, not everyone is convinced such synthetic fuel is a cure-all for greenhouse-gas pollution, with some analysts suspecting that backers of the technology like Lufthansa and Air France-KLM are just trying to deflect criticism.

But previous proposals, such as biofuels and battery-powered engines, never received the full-throated support of a leader like Angela Merkel. The German chancellor dismisses calls from climate extremists like Thunberg to ban air travel altogether, saying a solution to the emissions problem is just around the corner.

"The potential of hydrogen for aviation is far from tapped," Mrs. Merkel told industry leaders last August. "We don't want any restrictions on our mobility."

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