Why cars running on e-fuel can’t replace EVs

Porsche showed off a new pilot plant in Patagonia, Chile, last month — not one that manufactures cars but, rather, one that makes e-fuel, a synthetic alternative to conventional gasoline made from air and water using electricity. The plant, a joint project with ExxonMobil and other energy companies, “is a symbol of hope in the fight against climate change, for a more sustainable future — and one that might also feature the music of a Porsche engine,” Porsche boasts in a February 14th press release.

The dream that car companies like Porsche are selling with e-fuel is that drivers can keep their internal combustion engines and fight climate change at the same time. All they have to do is switch to e-fuel.

When it comes to cleaning up climate pollution from road transport, e-fuel is no silver bullet

The reality is that, when it comes to cleaning up climate pollution from road transport, e-fuel is no silver bullet. It’s way too expensive and inefficient to displace electric vehicles. And it still releases planet-heating carbon dioxide emissions when burned.

Despite those shortcomings, e-fuel managed to derail or at least delay the EU’s plan to effectively ban sales of combustion engine cars by 2035. The climate policy was nearly a done deal, with a final vote into law expected yesterday. Germany threw a last-minute curveball, withdrawing its support for the policy unless it allows traditional cars to stay on the road as long as they run on e-fuel.

A vehicle’s gas tank can be filled with synthetic e-fuel just like gasoline. Running on e-fuel produces tailpipe pollution like gasoline, too. But e-fuel can be made with renewable energy, which is behind the climate argument for it. And the carbon dioxide emissions it generates can potentially be canceled out during the process of making the fuel, making it nearly carbon neutral.

E-fuel can be made by pulling carbon dioxide (CO2) out of the air and hydrogen (H2) out of water molecules. That CO2 and H2 can then be used to build hydrocarbons, the main component of oil, gas, and coal. An alternative method, which Porsche relies on at the Patagonia plant, is to use the carbon dioxide and hydrogen to make methanol that’s then converted to gasoline.

Sounds nice, doesn’t it? It’s a way to harness air and water to make an alternative to fossil fuels. The challenge is that the process uses up a lot of energy. And the technologies it relies on — carbon removal facilities and electrolyzers to split water molecules — are still prohibitively expensive.

Even if renewable electricity is used (and there still isn’t enough renewable energy online to achieve climate goals), a lot of it is wasted in the process. Close to 50 percent of the energy input is lost in the process of turning that electricity into hydrogen and then turning that hydrogen into e-fuel, according to nonprofit research group the International Council on Clean Transportation (ICCT).

Because of that inefficiency, a car running on e-fuel burns through significantly more electricity than an EV would use to go the same distance. EVs wind up being around four times more energy efficient, according to the ICCT.

That inefficiency comes with significant costs. No one’s making e-fuel at commercial scale today, but doing so would probably cost around $7 a liter (more than $25 a gallon),

according to Stephanie Searle, director of ICCT's Fuels Program.

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The cost is "ludicrously high," she says, and won't fall low enough for e-fuel to become a viable option for cleaning up automobile pollution. When asked what role e-fuel might play in decarbonizing passenger transport, her response was blunt: "in short, none."

There's a little more optimism on e-fuel from Roland Dittmeyer, director of the Institute for Micro Process Engineering at the Karlsruhe Institute of Technology (KIT) in Germany. Dittmeyer drives an electric vehicle but thinks e-fuel might be a helpful alternative for someone who lacks access to charging infrastructure hooked up to a reliable, clean electricity grid.

KIT is making e-fuel as part of a national initiative. Its small demonstration project is also supported by Volkswagen, Audi, a Ford subsidiary, Shell, and other industrial partners. But cars aren't actually the focus of the research — planes are.

The best use of e-fuel is in aviation, both Dittmeyer and Searle agree. "The priority for the passenger cars is on the battery, [but] there is very little chance that you will ever fly with batteries over a long distance," Dittmeyer tells *The Verge*.

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Batteries are an easy way to get cars to run on renewable energy. But battery technology is still too heavy for planes, which will most likely need to rely primarily on alternative fuels to take off in a less polluting way. And Dittmeyer worries that all of the drama swirling around cars running on e-fuel might detract from research needed to develop the

synthetic fuel for aviation.

Meanwhile, the push to create a loophole for e-fuel in the EU’s climate policy is just an attempt to keep gas-guzzling cars on the road, Searle worries. “We’re afraid it’s a stalling technique to try to save the internal combustion engine and to create a future for it,” she says. And if they keep internal combustion engines on the road, it could be very hard for regulators to keep track of whether they’re actually running on e-fuel or plain old gasoline.

As we’ve seen, policy plays a key role in nurturing electric vehicle adoption. Global EV sales dropped this year as China and many countries in Europe slashed subsidies. EV sales were soaring before that shift, increasing 60 percent in 2022. For what it’s worth, Porsche is betting on both e-fuel and electric vehicles. It plans for 80 percent of its sales to be electric vehicles by the end of the decade.

https://www.theverge.com/2023/3/8/23630413/efuel-car-ev-gas-price-engine-cars