

An Introduction to eFuels

eFuels are **synthetic fuels** produced using electricity, via electrolysis or other electricity-based processes along with water and CO₂.

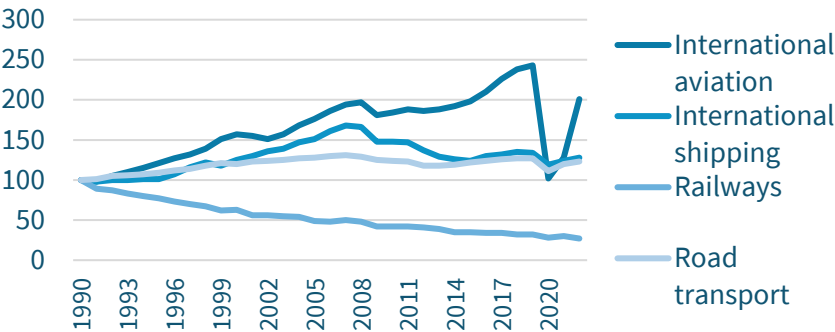
Share of global CO₂ emissions

3 % Globally comes from **shipping** (IMO, 2020).

2,5 % Globally comes from **aviation** (IEA, 2025).

- **Production:** via Power-to-Liquid (PtL) or Power-to-Gas (PtG) processes.
- **Drop-in solutions:** eMethanol, eNG, or SAF, are fully compatible with today's engines, storage systems, and fuel infrastructure.
- **CO₂ emissions:** close to carbon-neutral, as CO₂ released equals CO₂ used in production.
- **Objective:** matching the energy density of traditional fossil fuels; crucial in aviation, shipping and heavy industry.

Development of CO₂ emissions from transport in the EU

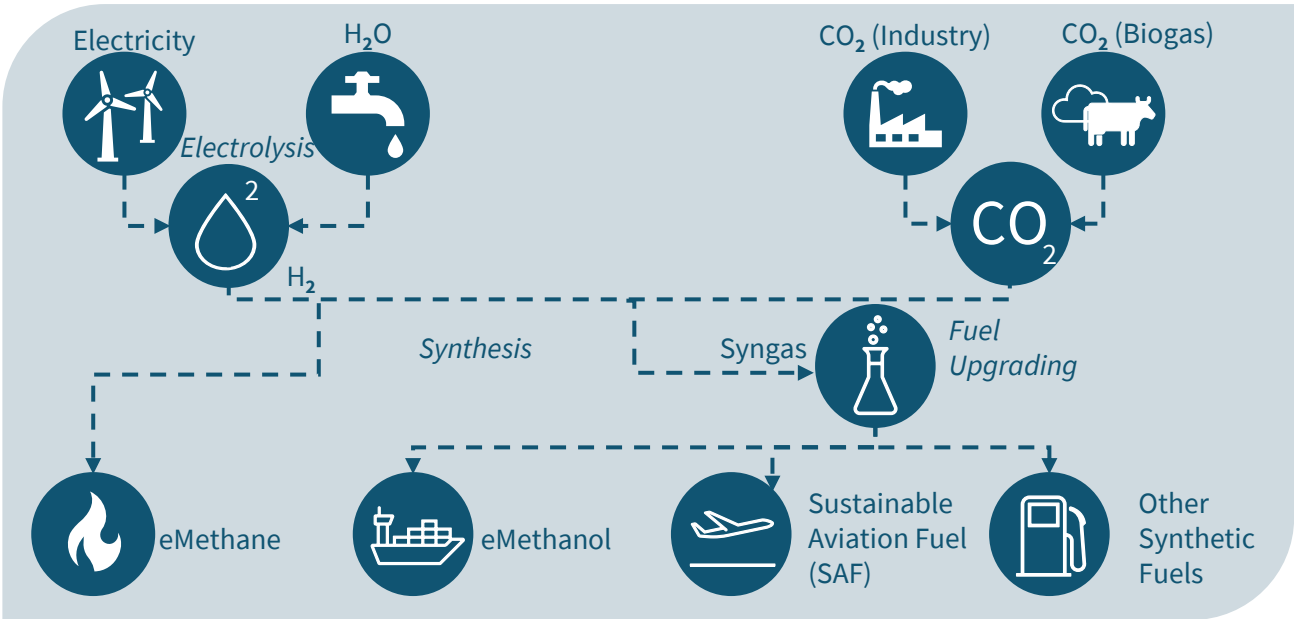


As electricity becomes increasingly affordable and regulations push the aviation and shipping industries to decarbonize, eFuels present strong growth potential as a sustainable replacement.

- Transportation fuels are a cornerstone of global mobility but contribute significantly to CO₂ emissions.
- Despite efficiency gains, transport sectors emissions are still growing, not only in the EU but worldwide.
- Shipping and aviation are particularly hard to decarbonize because they rely on liquid fuels and require long-range capabilities that batteries or hydrogen struggle to provide.

The Technology behind eFuels

eFuels use surplus **renewable electricity** to power water electrolysis and produce **hydrogen**, which is then combined with CO₂ creating hydrocarbons storing **clean energy** for later use in **existing engines** and **infrastructure**.



Recent Developments in eFuels

- ➔ **IMO Net-Zero Rules (2025):** The International Maritime Organization (IMO) adopted a global climate framework for shipping, including a low-carbon fuel standard and carbon pricing to take effect by 2027. This will drive demand for sustainable fuels like eMethanol, eLNG and eAmmonia. (Source: [imo.org](https://www.imo.org))
- ➔ **EU Aviation Fuel Mandate:** Under the ReFuelEU Aviation law, fuel suppliers must blend at least 1,2% synthetic fuels into jet fuel by 2030, ramping up to ~35% by 2050. This guarantees demand for e-kerosene and supports large-scale projects. (Source: transport.ec.europa.eu)
- ➔ **€70M Deal for Ineratec:** In January 2025, Ineratec secured a €70 million funding package to scale up one of Europe's largest synthetic fuel plants in Frankfurt, aimed at supplying e-fuels for aviation and road transport. The deal includes €40 million from the European Investment Bank and an additional €30 million from Breakthrough Energy Catalyst. (Source: [eib.org](https://www.eib.org))

Different eFuel Outputs



eFuel Technologies in the Tech for Net Zero Network

C1 Green Chemicals AG - a scale-up from East Germany - has fundamentally reinvented the underlying chemistry of methanol production. Their patented novel catalysis cuts both CAPEX and OPEX of methanol production in half compared to existing technology. This paves the way for cost-competitive production of green methanol at scale.



CAPHENIA is a Frankfurt-based cleantech startup that aims to shape the CO₂-neutral future of mobility through sustainable fuels at competitive prices. Using patented power-and-biogas-to-liquid (PbTL) processes, it converts CO₂ and biogas into Syngas to make renewable synthetic fuels.

Electrochaea is a startup for storage of intermittent renewable energy, utilisation of carbon and generation of synthetic eMethane. Their technology combines CO₂ with green hydrogen made from renewable electricity to produce BioCat eMethane, a low-carbon intensity drop-in substitute for fossil natural gas in a proprietary, flexible and scalable system.



ICODOS is a German startup that delivers groundbreaking eMethanol production solutions. Leveraging their patented hybrid process, they transform harmful off-gases into highly versatile liquid eMethanol. When produced sustainably, this eMethanol can help decarbonize both the transportation sector and the chemical industry.

INERATEC supplies modular chemical plants for power-to-X and gas-to-liquid processes as well as sustainable fuels and chemical products. Hydrogen from renewable electricity and greenhouse gases such as CO₂ are used to synthetically produce climate-neutral gasoline, clean eDiesel, sustainable eKerosene and basic chemicals such as wax.



Spark e-fuels is a startup that is developing an integrated eFuel SAF production systems that can be connected to lowest-cost renewable electricity directly. Spark's technology is based on proprietary load-flexible eFuels production processes to achieve lowest-cost and scalable eFuels production

TURN2X has developed a technology to produce renewable natural gas (eNG) using green hydrogen and CO₂. Their eNG is carbon-neutral and seamlessly integrates with the existing natural gas infrastructure. Their patented modular technology ensures rapid deployment and is designed to be easily financed through project finance.

