

Overview of new fuels in France

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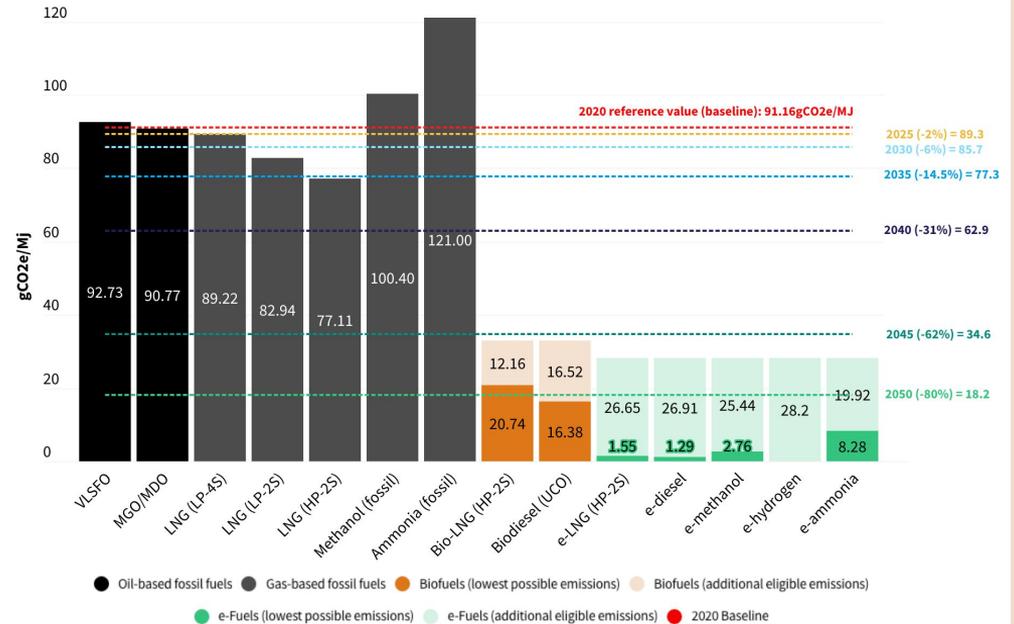
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1. Which fuels are we talking about

e-Fuels will comply with the FuelEU Maritime the longest

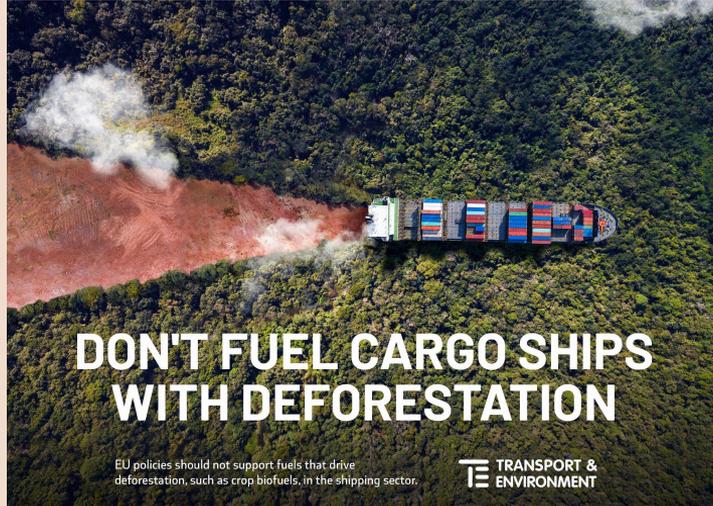


Possible eligibility timeline for marine fuels and engines under FuelEU Maritime Regulation



Source: T&E analysis (2023) based on the FuelEU Maritime Regulation, Renewable Energy Directive (RED III); N₂O from ammonia engines is assumed to be 20ppm (0.2gN₂O/kWh of energy output) based on discussions with the industry. Our analysis assumes 50% thermal energy efficiency of ammonia engines. Values for LNG include emissions from the share of diesel necessary as pilot fuel (e.g. 1% and 8% of fuel consumption by Otto and Diesel-cycle LNG engines; ammonia engine values tbd). It is assumed that Bio-LNG powered vessels use VLSFO as pilot fuel. E-fuels values are calculated according to the EU RFNBO delegated act's methodology, assuming production from additional renewable electricity and zero-emission transport and distribution. GWP: CH₄-25, N₂O-298 (as per RED III).

Biofuels are not sustainable or have limited availability



1st gen. biofuels = unsustainable

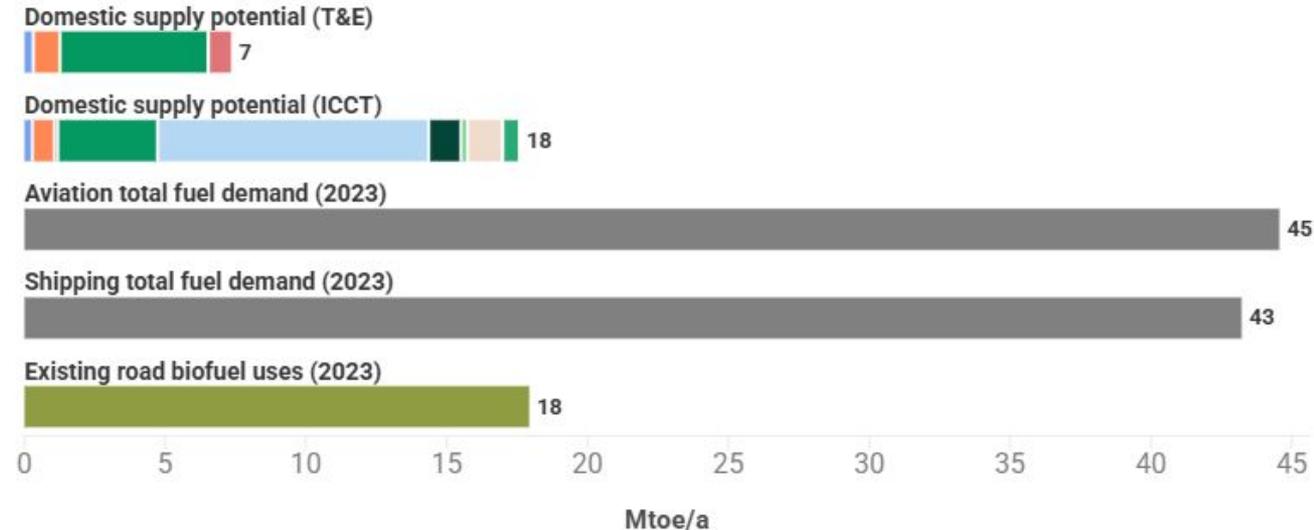
— as per Fuel EU, but appetite from the lobby

<p>Palm derivatives Directly related to deforestation, Palm Fatty Acid Distillates (PFAD) should not be used for biofuels, while other residues such as Palm Oil Mill Effluent (POME) should be used in producing countries.</p> 	<p>Agricultural residues Since agricultural residues are already used for soil amendments and biogas production and are anticipated for various biomaterial applications like building insulation, they should not be prioritised for biofuels production.</p> 	<p>Biodegradable fraction of municipal and industrial waste While mixed fossil waste should not be used for biofuels, separately collected biowaste could provide emission savings when converted to biofuels. However, their availability is expected to decrease with increased reuse and recycling efforts and conversion processes are still uncertain.</p> 
<p>Forestry residues Primary forestry residues are essential for forest regeneration, biodiversity and carbon sinks and should be left in forests. Secondary residues from wood transformation should be prioritised for long-lasting application such as biomaterials.</p> 	<p>Used cooking oil Waste oil collected from households or restaurants can be used to produce sustainable biofuels if collected domestically. Imported feedstocks or biofuels are likely subject to fraud and should be prioritised for the producing countries' own needs.</p> 	<p>Sewage sludge Produced from wastewater treatment facilities, sewage sludge can be used to produce sustainable liquid biofuels, but conversion processes remain currently uncertain.</p> 
<p>Intermediate crops With risks of triggering additional demand for land, increasing the use of fertilisers, pesticides and irrigation, intermediate crops should be prioritised for non-energy uses.</p> 	<p>Animal fats By-products of industrial meat production, animal fats in categories 1 and 2 can be considered as a sustainable source for biofuels production if collected domestically. Because of existing uses as animal feed or in the oleochemical industry and high risks of indirect emissions, animal fats in category 3 should not be used for biofuels.</p> 	
<p>Energy crops Difficult to monitor and potentially subject to fraud, crops grown on severely degraded land and other energy crops should not be used for biofuels, as rewilding could bring more climate and biodiversity benefits.</p> 		

2nd gen. biofuels (waste and advanced biofuels) = limited availability

Sustainable biofuels will remain scarce in the EU, even for aviation and shipping

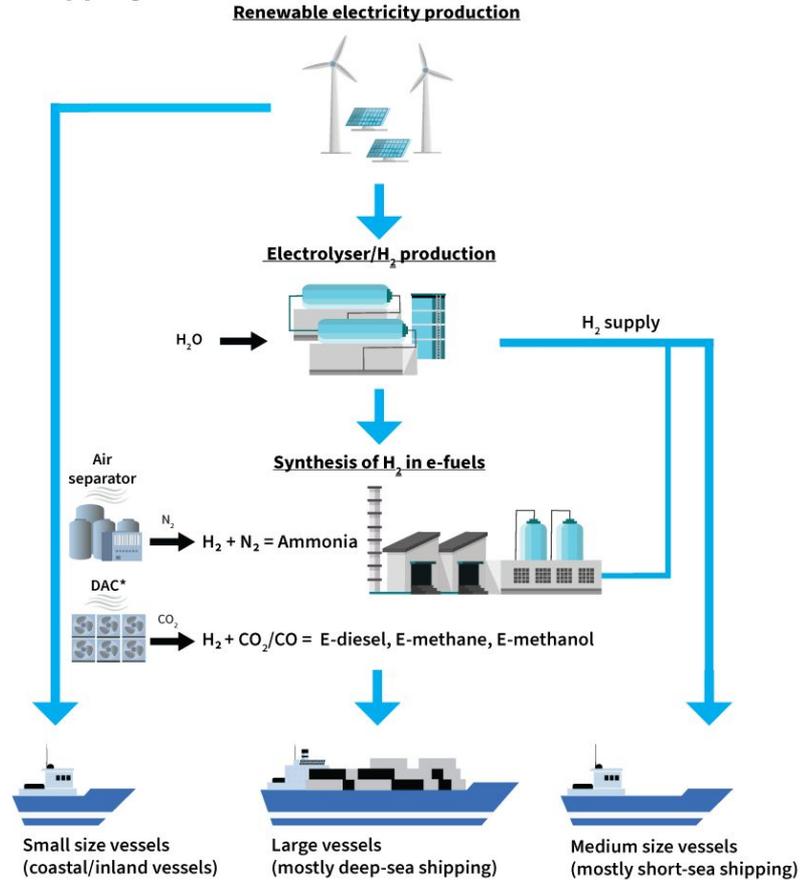
■ Inedible tallow ■ UCO ■ Tall oil pitch ■ Municipal solid waste ■ Agricultural residues
■ Forestry residues ■ Crude tall oil heads ■ Industrial flue gas ■ Seweage sludge



Source: T&E. Based on ICCT (2024), Availability of biomass feedstocks in the European Union to meet the 2035 ReFuelEU Aviation SAF target, and T&E (2024), The Advanced and Waste Biofuels Paradox in House T&E Analyses. Biodiesel supply analysis is for the year 2035. Fuel demand and existing biofuels uses from Eurostat.



Production pathways for sustainable and scalable shipping fuels

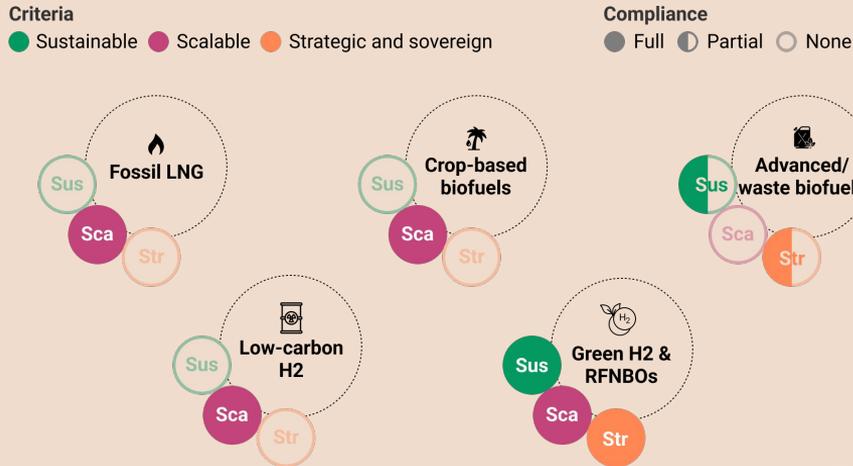


*Direct Air Capture. DAC is the only sustainable technology to capture CO₂.

Only green e-fuels qualify for the EU Clean Industry goals

Decarbonisation and competitiveness go hand in hand.

To meet Europe's industrial and climate goals, maritime fuels should meet these criteria:



Source: T&E

→ **Sustainable** - real emissions reductions across the lifecycle, without harmful trade-offs

→ **Scalable** - able to meet European shipping demand without technical supply constraints

→ **T&E Strategic & Sovereign** - leveraging Europe's renewables potential and industrial capabilities to increase energy independence

→ **But crazy expensive !**

2. T&E e-fuels observatory

Europe has many ongoing e-fuels projects ...

83 e-fuels projects (4.03 Mtoe by 2032.)
e-hydrogen, e-methanol, e-ammonia and e-methane

< 6% dedicated to **primarily** shipping

< **FuelEU's 2031 1% e-fuel uptake** threshold
and well below the 2034 subquota of 2%.

- **Lack of regulation certainty**
- **Lack of offtake agreements**
- **Lack of financial incentives and funding**
- **Competition of uses (aviation, refineries...)**



... but very few have reached final investment decision (FID) !

OPERATIONAL:

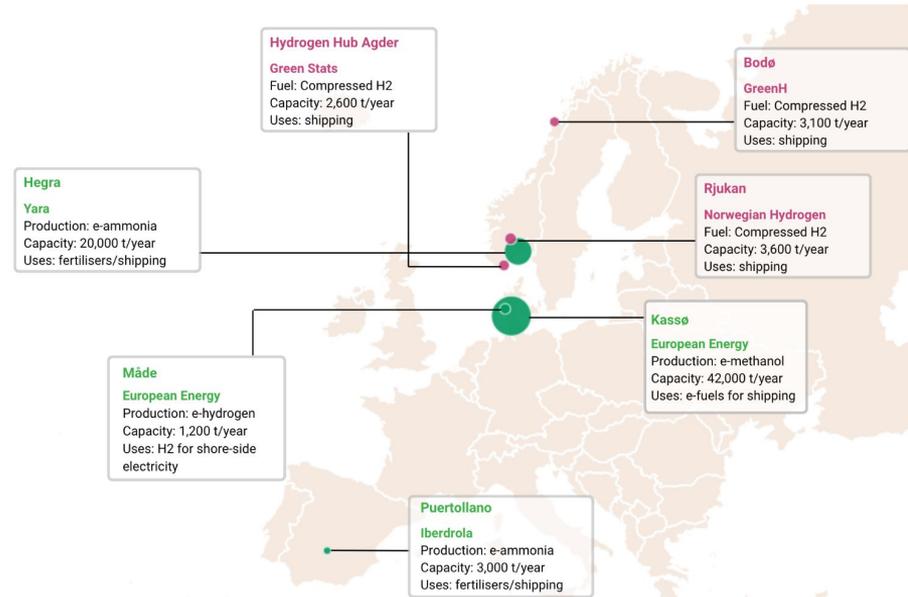
1. The **Kassø project** (European Energy):
42,000 tonnes/year e-methanol
(Maersk)
2. The **Heroya project** (Yara):
20,000 tonnes/year e-ammonia
3. The **Puertollano project** (Fertiberia):
3000 tonne/year e-ammonia

POST-FID:

1. The **Hydrogen Hub Agder project** (Green Stat)
2600 tonnes/year - green hydrogen
2. The **Bodø project** (GreenH):
3100 tonnes/year green hydrogen
3. The **Rjukan Project** (Norwegian Hydrogen):
3600 tonnes/year green hydrogen

While there are some post-FID and operational e-fuels volumes for shipping, these remain small.

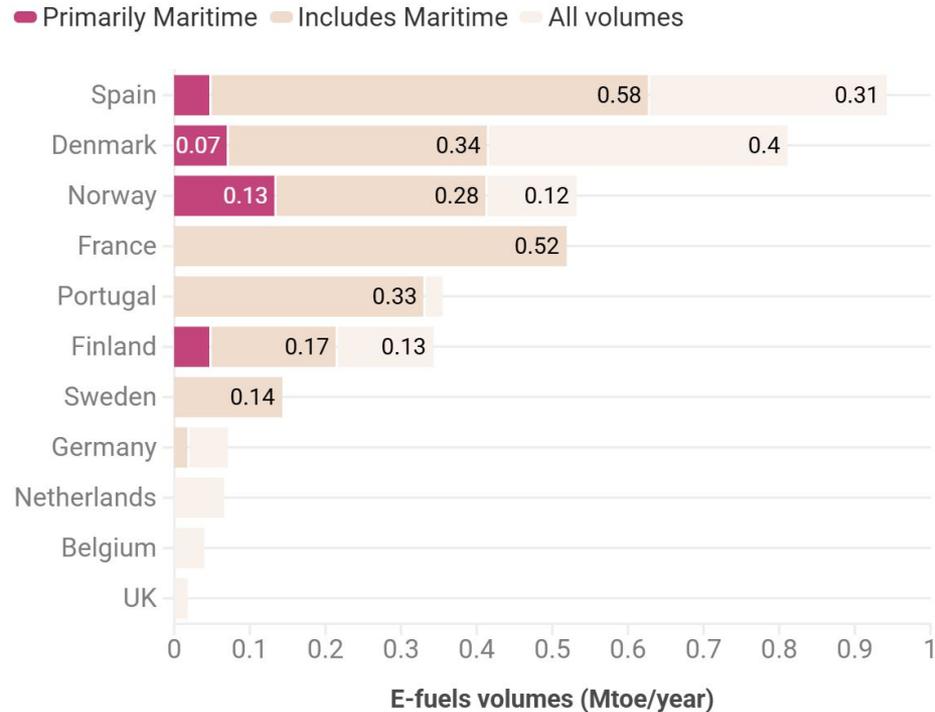
Tonnes per year (different fuel types) 2500 ○ ○ 5000
Status ● Operational ● FID - Decided



Source: T&E Shipping E-fuels Observatory (2025)

- Majority of e-fuel projects planning to become **operational** between **2027-2029** .
- **E-methanol** : most cited volumes dedicated to maritime (0.16 Mtoe compared to 0.11 Mtoe for ammonia).
- **E-methane** : no volumes primarily dedicated primarily to shipping, and only presenting in Finland.
- **No new FID in 2025 for e-methanol, e-ammonia, nor e-methane** . Only 1 FID reached for hydrogen in Norway.

Spain and Denmark hold the largest potential e-fuel volumes, but Norway leads the way on e-fuels dedicated to the maritime sector.



Source: T&E Shipping E-fuels Observatory (2025) • Includes all green hydrogen and e-fuels projects regardless of their development stage (pre-FID, post-FID, or operational). Projected operational dates between 2025 and 2032.

Focus on France

Key Assets and Project Landscape



8 e-methanol projects (500 ktoe)



Stable and low-carbon grid, lots of biogenic CO2



Dependance on aviation projects

Future Issues and Challenges



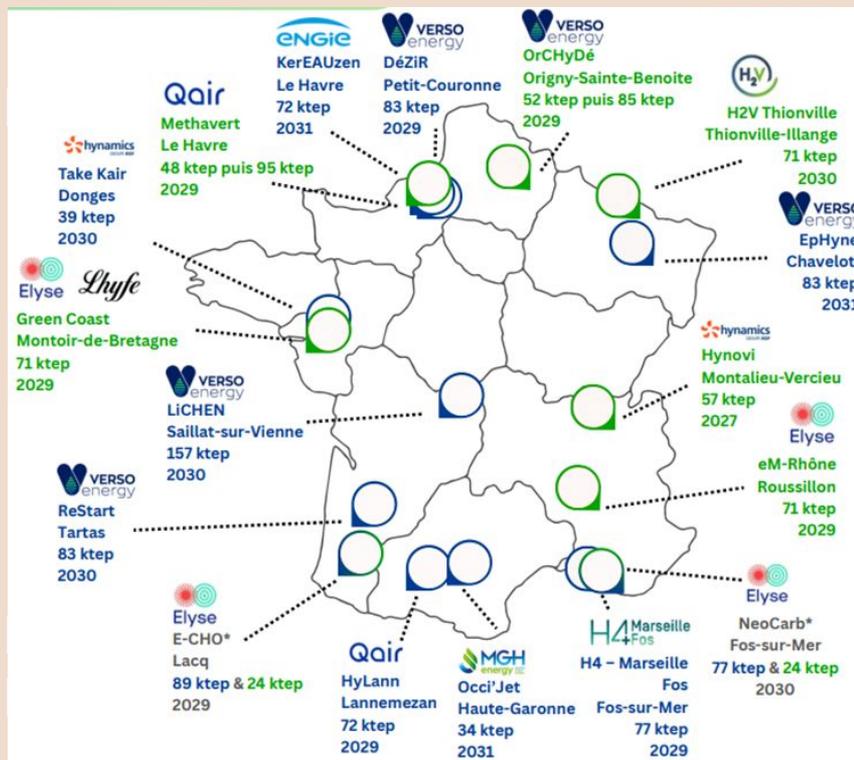
High electricity demand

2035: 14 TWh (1 nuclear reactor)

2050: 150 TWh (11 nuc. reactors)



CO2 availability : a concern after 2040



Map : Project locations ; Annual production capacity of e-SAF and e-methanol in ktoe/year ; Projected initial operation date. Source: France Hydrogène, 10/2025

**What all of this
mean ?**

**Weak regulation
=
no project, no
competitiveness**

**A missed opportunity for
EU clean tech leadership
and climate objectives**



3. Legal implications in France

Transposal of RED III

- **Implementation of RED** takes years : **very complex file**, low level of political attention and expertise, **lack of harmonisation** b/w MS
- **French transposal** : mechanism to incentivize the reduction of the carbon intensity of fuels (*Incitation à la réduction de l'intensité carbone des carburants (IRICC)*) - **adoption still pending**

Proposal includes:

- Obligations until 2035 with progressive enforcement for shipping
- Scope : international bunkering volumes + inland navigation + Ships < 500 GT
- 1,2% RFNBO target for fuel suppliers in real energy terms
- E-fuels target for electrolysis from the grid (low carbon nuclear electricity) and RFNBO
- Multiplier for volumes over the 1,2% target
- Credits for installation of OPS

Uncertainty remain

- Legal framework : IMO vs EU (upcoming revision of Fuel EU Maritime and RED III)
- Political instability in France
- Funding strategy of e-fuels producers
- Oil and gas companies : the missing ones !
- Competition between EU ports
- Competition with e-fuel production outside Europe