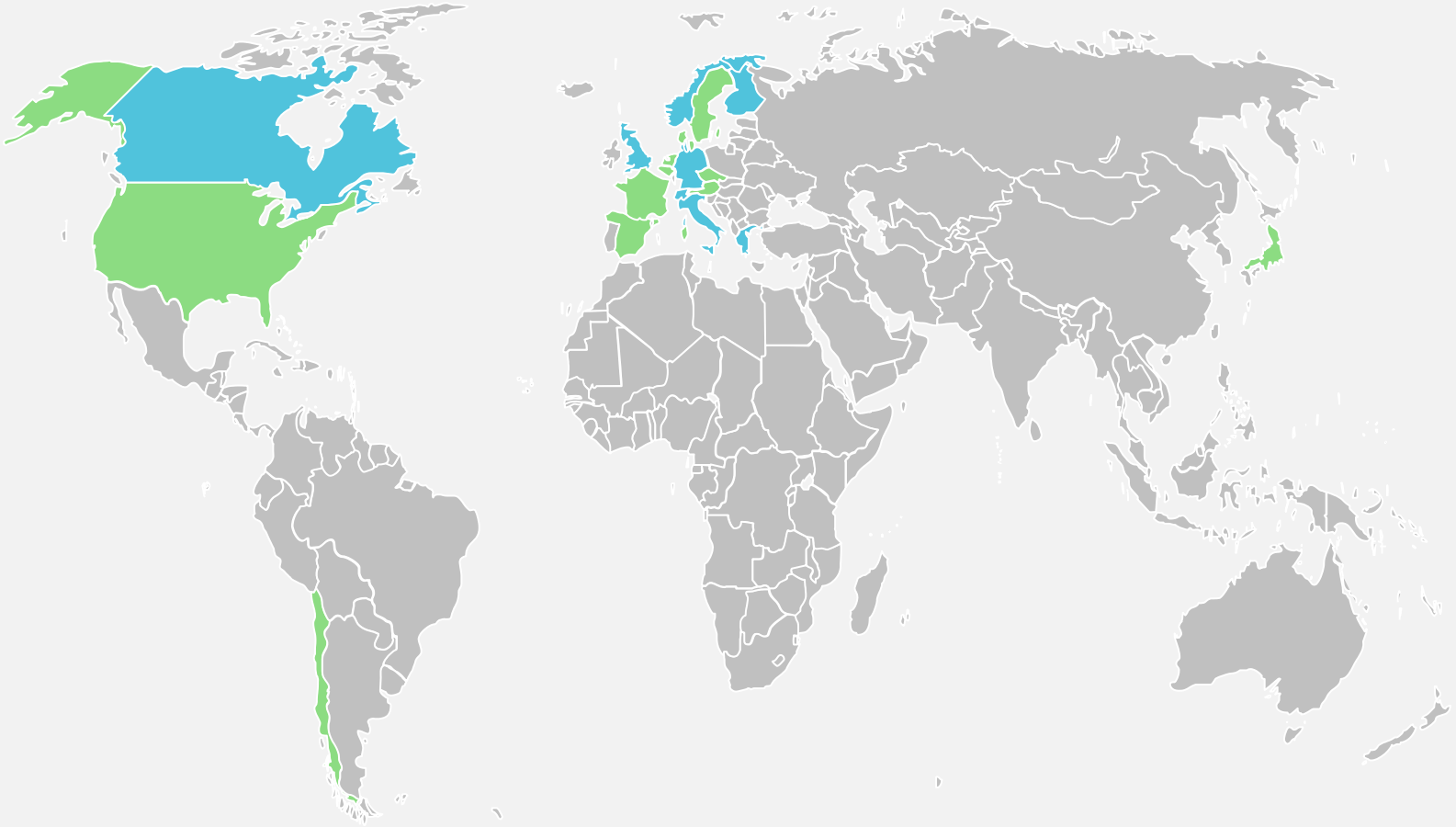
Developing New Carbon-Neutral Fuel Supply Chain

Ralf Diemer | CEO | eFuel Alliance | 03rd December 2024

OUR MEMBERS

MORE THAN 170 COMPANIES, ASSOCIATIONS AND
CONSUMER OGRANIZATIONS, INCLUDING:

Global impact



MORE THAN 180 MEMBERS IN 17 COUNTRIES WORLDWIDE

Our Mission

Lobbying Trailblazer

We are a **lean and fast-lobbying "trailblazer"** created to foster a strong renewable fuel market within the next 2-3 years, representing the whole value chain of eFuels.

Fair competition

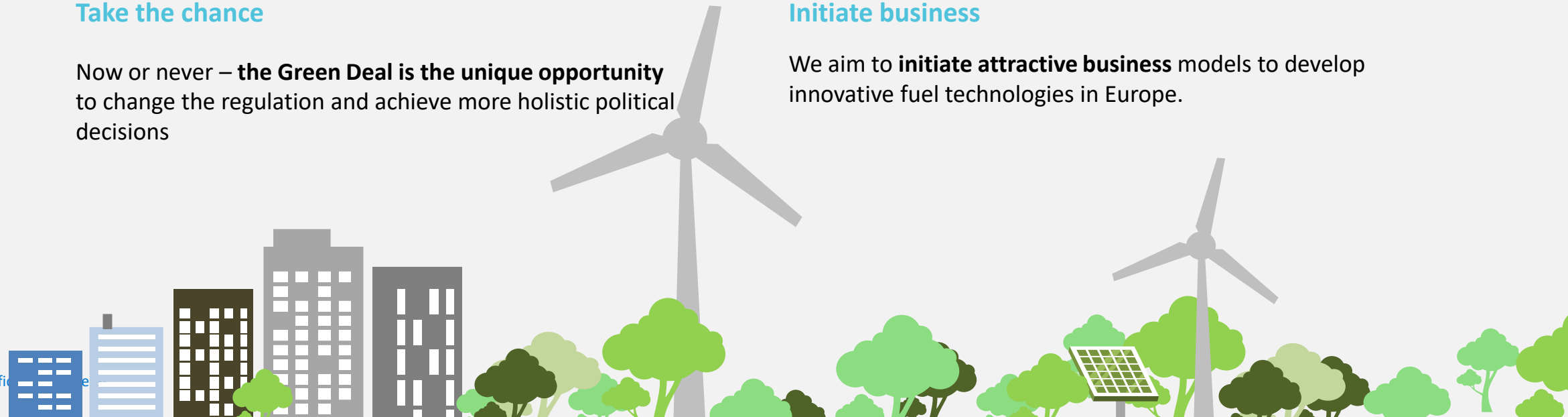
We stand for **fair competition** and a **level-playing field** for all relevant emission reduction solutions. We are clearly committed to more climate protection and are not fighting against any single technology.

Take the chance

Now or never – **the Green Deal is the unique opportunity** to change the regulation and achieve more holistic political decisions

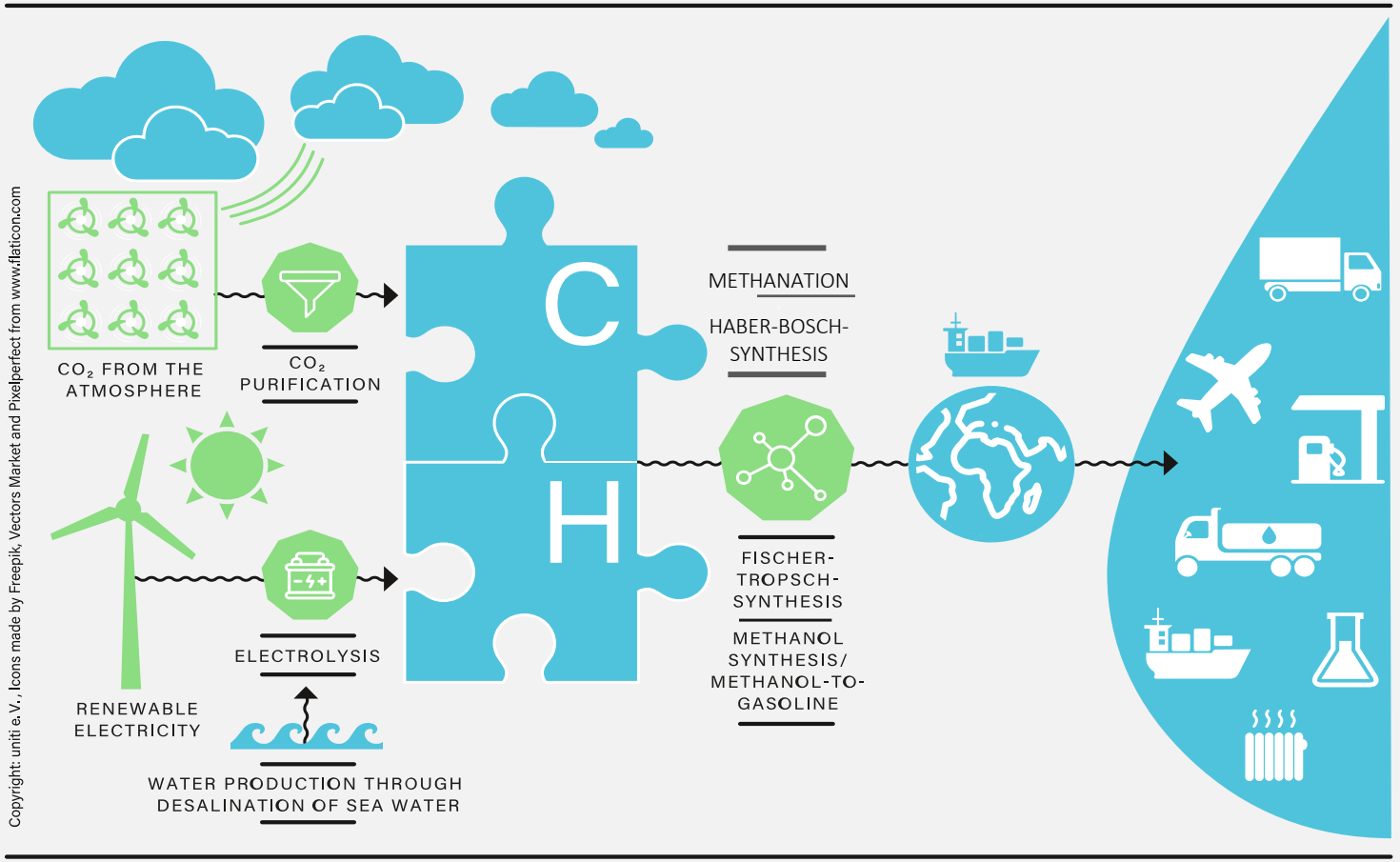
Initiate business

We aim to **initiate attractive business** models to develop innovative fuel technologies in Europe.



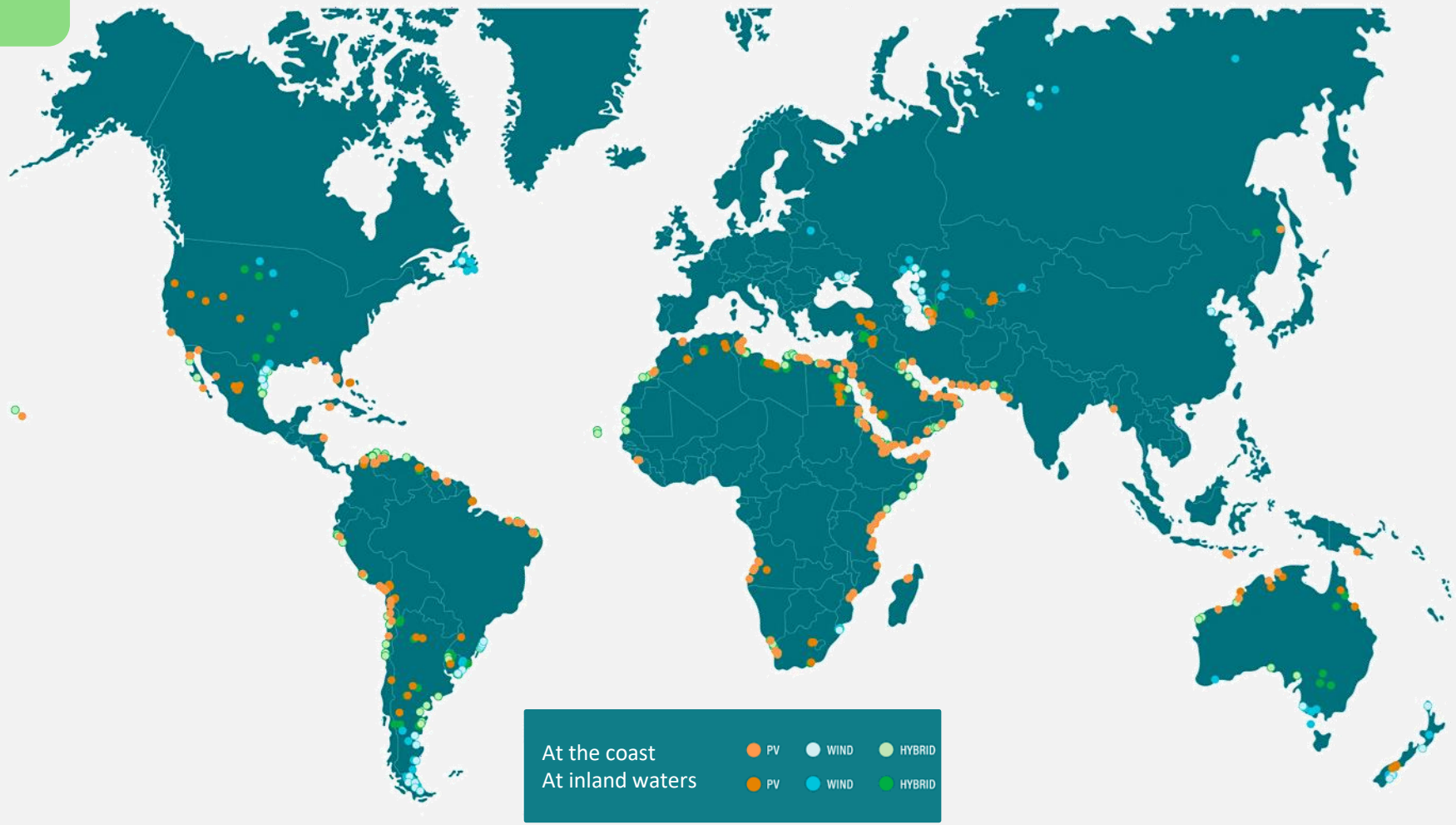
What are eFuels?
Where are eFuels produced?
What will eFuels cost?

How are eFuels produced?



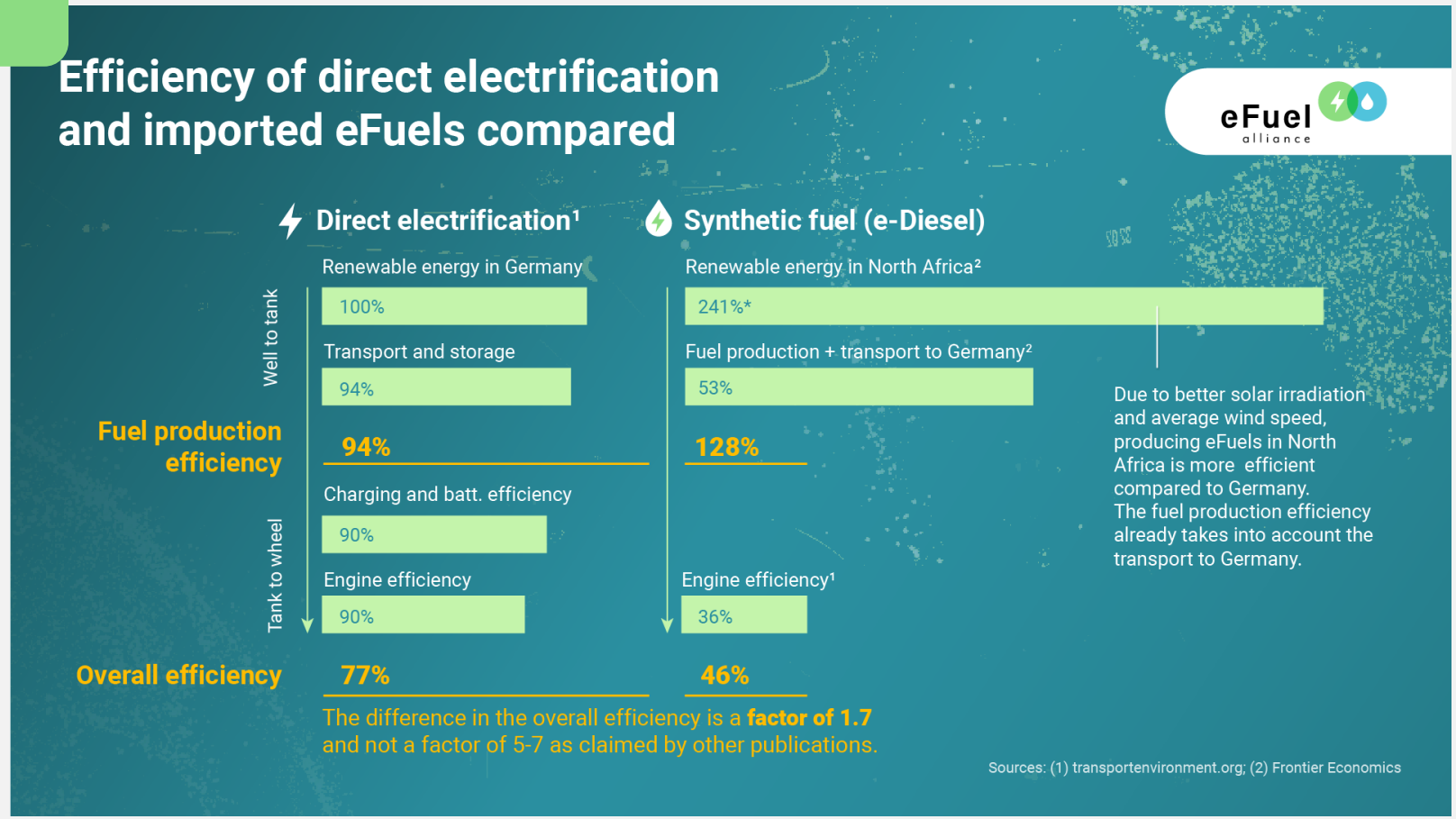
- Extraction of hydrogen from water by electrolysis using renewable electricity
- Hydrogen and CO_2, directly captured from the atmosphere, are converted into a liquid energy carrier, by using e.g. Fischer-Tropsch synthesis.
- Power-to-X (PtX): Renewable electricity is converted into a synthetic, multi-purpose fuel with drop-in ability
- Climate-neutral process, no additional greenhouse gases are produced

Availability check: PtX potential worldwide



- Fraunhofer IEE explored the potential outside the EU for the production of green H_2 and climate-neutral synthetic fuels
- **85,000 to 88,000 TWh** of climate-neutral synthetic fuels could be produced outside Europe
- Global energy consumption by transport in 2019 totaled **33,603 TWh**

Efficiency in a global context



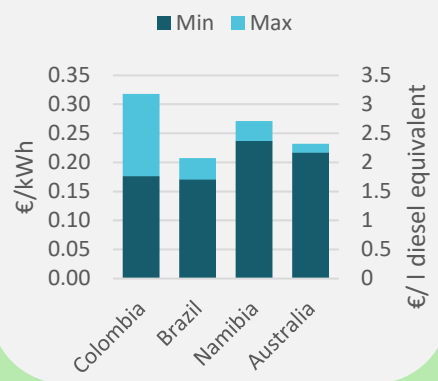
- **Better utilization of renewable electricity generation in proper region is compensating efficiency** losses along the value chain
- A photovoltaic module in North Africa generates 2.4 times electricity than in Central Europe
- **eFuels make renewable electricity storable and transportable via an existing infrastrcuture**

eFuel production costs (Fraunhofer ISE, 2023)

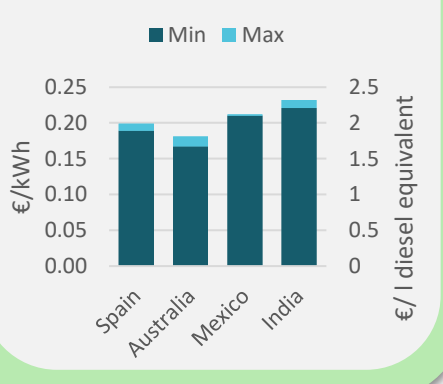
Prices of eFuels including transport costs to Europe in 2030

- Without taxes and margin
- CO2 source: direct air capture

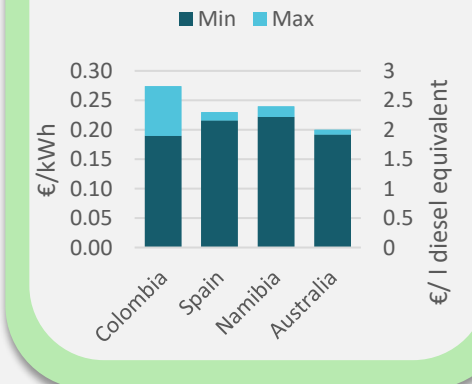
Liquid Hydrogen



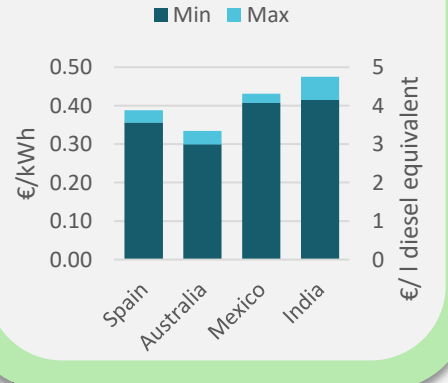
Fischer-Tropsch-Mix



Methanol

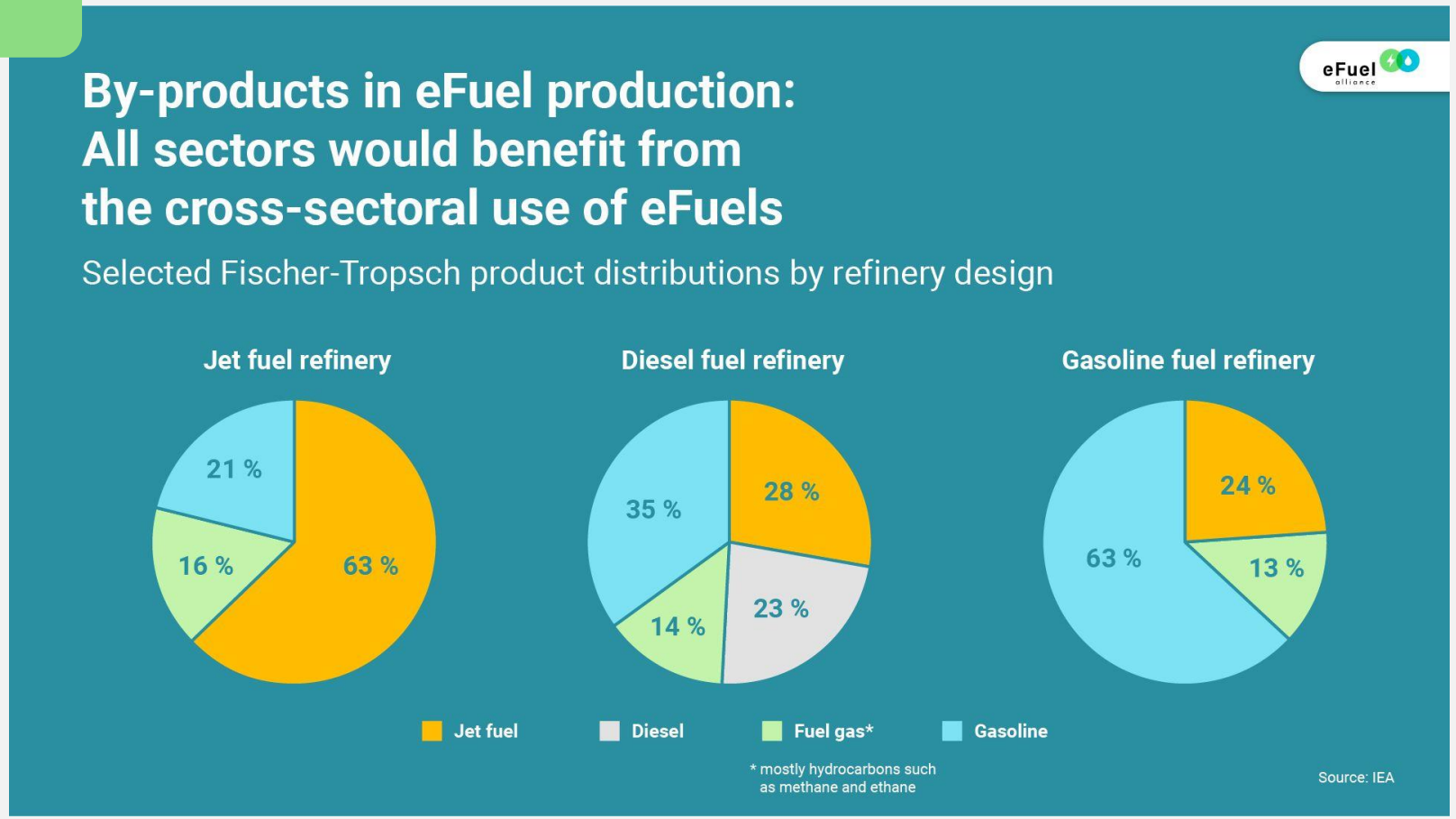


Jet Fuel



Source: Fraunhofer ISE, Site-specific, comparative analysis for suitable Power-to-X pathways and products in developing and emerging countries

By-products as benefit, not hurdle



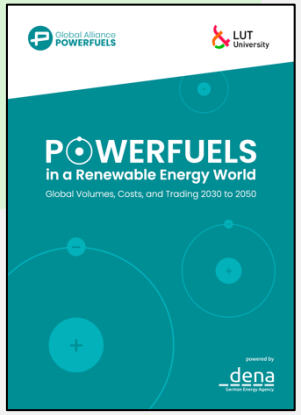
- Relevant esp. for co-processing and usage of **existing refineries**, but also **new installation**
- Having offtake from different sectors to assure a cross-sector usability **enhances project bankability and mitigates risks**
- lower prices through larger volumes that are earlier on the market will accelerate the energy transition in the shipping-, aviation-, chemical-industry as well as road transport

Source: IEA (2023) The Role of E-Fuels in Decarbonising Transport

eFuels have high economic value

LUT-University

- More than **40,000 TWh of eFuels** required until 2050: 22,737 in transport, 15,514 in the chemical industry and 5,000 in the heating sector.
- **18,000 b€ of investments** required until 2050.
- Cost range of 45 to 75 €/MWh in 2050.
- **Global trade will reduce** the levelized cost of eFuels by up to 30 % in some regions compared to a self-supply scenario.



Institute of the German economy

- In a scenario with 20,000 TWh of eFuel demand:
- **1.22 million additional jobs in Europe** through the export of machines, equipment and plants for producing eFuels
- 80 b€ in additional annual added value.
- More than **340,000 new, highly productive jobs** can be created at PtX production sites (**exporting country**).

PwC study on automotive industry in Europe

- A technology-mix in which renewable fuels complement the expansion of electromobility in road transport would maintain stable employment. By contrast, an e-vehicle-only policy **would put at risk 501 000 jobs in Europe's ICE domain by 2040**.
- In an EV-only scenario, 70% of value-add (or approximate 70 b€) is entirely dependent on the development of a full EU battery chain.

Source: PowerFuels in a Renewable Energy World (2020), Synthetic fuels: Potential for Europe (2021), Electric Vehicle Transition Impact Assessment (2020-2040)

Political framework of eFuels

Different policy philosophies in US, EU and Japan

- Incentives instead of bans and restrictions (Inflation Reduction act) on renewable electricity generation, direct air capturing, green hydrogen and sustainable aviation fuel
- Carrots: Tax incentives reduce costs, but no guaranteed demand for producers
- “Taxpayer funds” principle
- No ban of fossil CO2 sources but restrictive clean hydrogen act in preparation

- 27 Member States, EU with limited competences (e.g. taxation)
- Sticks: Mandates guarantee demand, penalties set maximum price
- Limited budget to fund market uptake
- Green or nothing: benefits only for RFNBO
- “Polluter pays” = “Consumer pays” principle

- Dedicated eFuels strategy
- Close cooperation of ministries with companies, targets for 2030, 2035 and 2040 to be set together with the Japanese industry
- More pragmatic and flexible towards fuel requirements and feedstocks, e.g. including CO2 from industrial point sources
- No demand policy in place

Regulative framework for eFuels in EU

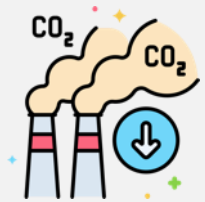
All regulations are open or will be revised in the next 3 years

CO2 standards for new cars and trucks

Stipulates the reduction of tailpipe emissions for new vehicles. No recognition of eFuels. Review in 2026/27

Renewable Energy Directive (REDIII)

Sets targets for renewable energy, incl. targets for the transport sector with specific sub-quotas. Set restrictive production criteria (del. acts). National implementation until May 2025. Review in 2027.



EU Emissions Trading System

Prices CO2 emissions and gradually reduce available allowances. Revenues are used for funding schemes e.g. SAF allowances and Hydrogen Bank

FuelEU Maritime

Commits shipping industry to reduce the emission intensity of its used energy by 2050. Binding quota of 2% eFuels in 2034.

ReFuelEU Aviation

Sets increasing mandatory blending quotas for sustainable aviation fuels by 2050. Binding quota of 1.2% eFuels in 2030/2031.

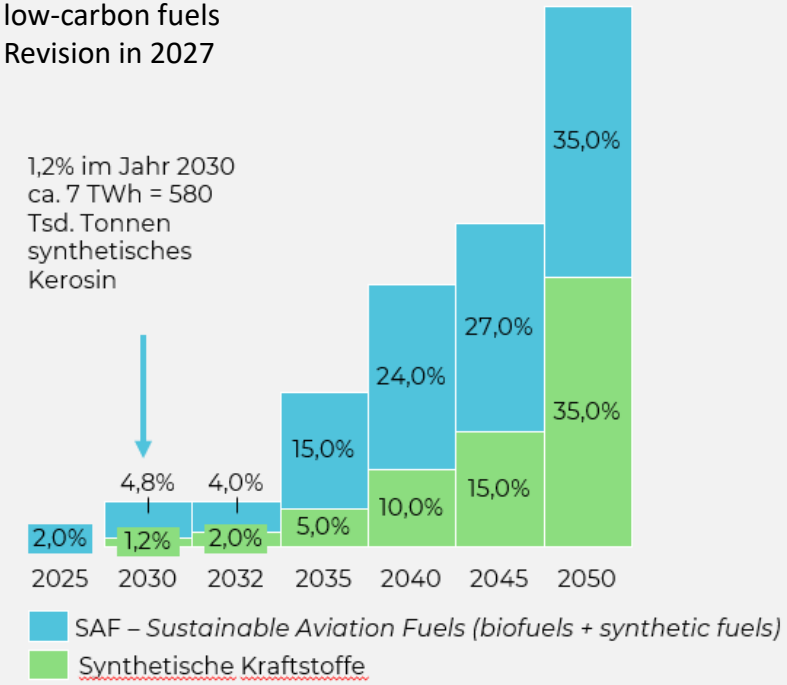
Energy Taxation Directive

Doesn’t differentiate between fossil and renewable energy sources, based on energy content. Commission proposed low tax rates for eFuels.

Aviation and Maritime

ReFuelEU Aviation

- Publication in the Official Journal on 31.10.23 (Regulation (EU) 2405)
- Commitment for aviation fuel suppliers
- Definition of synthetic aviation fuels includes RFNBO and low-carbon fuels
- Revision in 2027



FuelEU Maritime

Publication in the Official Journal on 22.09.23 (Regulation (EU) 2023/1805)
Obligation for shipping
Scope: Ships over 5000 GT, 100% of intra-EU and 50% of in/outbound voyages
Revision in 2028

Sunrise clause on the RFNBO partial quota:

- If a 1% share of RFNBO is not reached in 2030, a partial quota of 2% will be required from 2034 (also achievable by other fuels)
- 1% equals 3 TWh = 260 thousand tons of synthetic marine fuel oil

GHG Intensity Limits	
2025	-2%
2030	-6%
2035	-14,5%
2040	-31%
2045	-62%
2050	-80%

Regulatory view on biofuels and eFuels

IN THE RENEWABLE ENERGY DIRECTIVE (RED), FUELEU MARITIME AND REFUELEU AVIATION

	Renewable fuels of non-biological origin (RFNBO)	Advanced Biofuels (RED Annex IX Part A)	Mature Biofuels (RED Annex IX Part B)	Conventional/Food and feed crop-based biofuels
REDIII	Multiplier x2			limited to 7% of transport energy
	2025: 1% combined quota for advanced biofuels and RFNBO 2030: 4,5% combined quota for advanced biofuels and RFNBO, of which 1% RFNBO		Limited to 1.7% of transport energy	
	Multiplier x1,5 when supplied to maritime and aviation	Multiplier x1,2 when supplied to maritime and aviation		
ReFuelEU Aviation	2025: 2% SAF 2030-2031: 6% SAF, of which 1,2% synthetic fuels (includes RFNBO and low-carbon fuels) 2032-2034: 6% SAF, of which 2% synthetic fuels 2035: 20% SAF, of which 5% synthetic fuels 2040: 34% SAF, of which 10% synthetic fuels 2045: 42% SAF, of which 15% synthetic fuels 2050: 70% SAF, of which 35% synthetic fuels			Any biofuels from feedstocks not included in Annex IX are limited to 3%
FuelEU Maritime	2025-2033: Multiplier x2 towards GHG intensity limits	Eligible for GHG intensity limit	Eligible for GHG intensity limit	Food and feed crop-based biofuels and any fuel not certified under EU legislation has to use the GHG intensity of the equivalent fossil fuel
	Sunrise clause: If in 2031, a 1% share of RFNBO is not reached, a 2% sub-quota will be mandated from 2034	sub-quota can also be fulfilled by advanced biofuels and low-carbon fuels		

Exclusion of Key Markets Like the Road Sector

REGULATIVE STATUS QUO

CO_2 standards for new cars and vans

Entry into force in May 2023 (Regulation (EU) 2023/851)
CO_2 reduction targets (tailpipe approach):
2030: - 55 %
2035: - 100 %

CO_2-neutral fuels (CNF):
Final vote in the Council on 27 March: Commission to present solution for the approval of combustion vehicles powered by CNF after 2035 (recital)
The Commission's first proposal (Sept. 2023):
Only RFNBO with 100% CO_2 reduction permitted

Trial stalls due to criticism
- Definition of CNF and the Inclusion of biofuels raised concerns
- Doubts about the legality of the process

CO_2 standards for new trucks

Provisional agreement reached on 18 January 2024
CO_2 reduction targets (tailpipe approach):
2030: - 45%
2035: - 65%
2040: - 90%

Zero- and low-emission vehicles (ZLEV) ≤ 3gCO_2/t.km (fuel cell, hydrogen engine, electromobility)

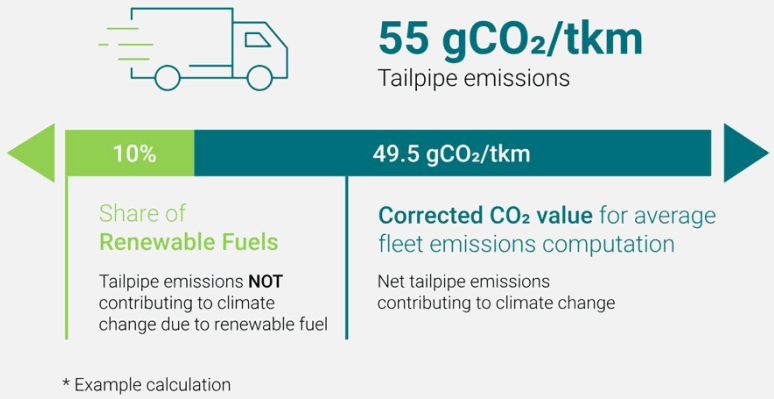
CO_2-neutral fuels (CNF):
Coreper meeting on 9 February:
- non-binding recital: within one year, evaluation of a methodology for the approval of trucks running exclusively on CNF. Here biofuels are included.

Evaluation at revision 2027:
- Carbon Correction Factor (CCF)
- Use and incentive of sustainable fuels for the vehicle fleet

How to include fuels in the CO2 emission standards

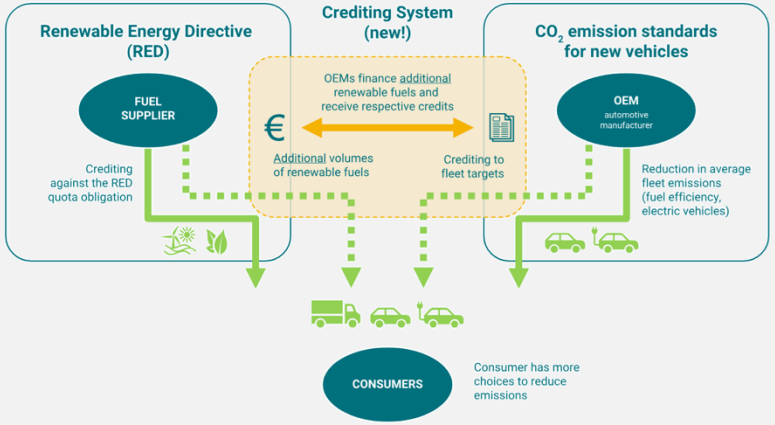
DIFFERENT APPROACHES EXIST AND ARE COMPLEMENTARY

Carbon Correction Factor



- Existing share of CNFs are considered and reduce the CO_2 tailpipe value
- More information here

Crediting System



- Manufacturers can offset remaining emissions by additional CNFs on voluntary basis
- More information here

New vehicle class for exclusive use of CNF

- More than 55 industry players evaluate monitoring methodologies from a technical and political perspective
- Final report available in Dec. 2024

Benefits of a membership in the eFuel Alliance

1 **Supporting membership**

2 **Ordinary membership**

3 **Active membership**

Political exchange

Exchange with political as well as involvement in political processes:

- Position papers
- Representing interests in bodies of the European Commission (Renewable and Low Carbon Fuels Value Chain Industrial Alliance; CCUS Forum)
- Building alliances

Active participation

Active participation in the eFuel Alliance:

- Sherpa Circle (updates on legislative processes; discussion of political positioning and strategies)
- Technical working group (expert presentations and discussions on technical issues)
- Communication working group (development of common arguments and formats)

Providing information

Information and expertise on EU legislation; legislation in EU Member States and relevant global developments:

- Twice-weekly monitoring
- Analysis and summary of EU legislative texts and amendments

Networking

- Networking with over 170 eFuel Alliance member companies from various sectors
- Event participation

Media work

- Placing member companies in the media and at (trade) congresses & trade fairs
- Comprehensive social media and press work

eFuel Alliance

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