

Role for e-Fuels in EU transport?

Industry perspective on future developments

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e-Fuels - Renewable energy for transport

Renewable Hydrogen (H₂)

Conversion of water into hydrogen and oxygen



Carbon Capturing

CO₂ extracted from unavoidable sources or the atmosphere



e-Crude, e-Hydrogen



**e-Diesel, e-Gasoline,
e-Methanol, etc.**

Renewable Electricity Only!

Wind and solar costs
< 5 € Cent/kWh
@ ~4.000 full-load hours

Ready-to-Use

Direct effect on existing EU fleet
Suitable for hard-to-electrify sectors
No-regret measure as e-Fuels can be delivered to all forms of transport and are needed in any 2030-2050 scenario



Europe - Global leader in e-Fuels development



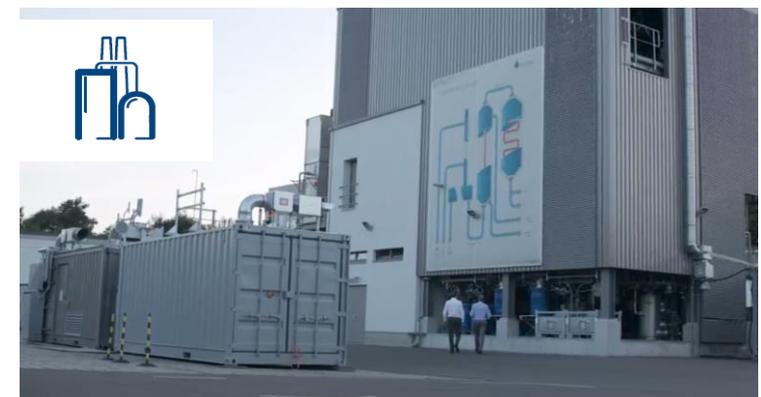
Global Leader in CO2 capture from air (TRL 5-6)
Climeworks, Switzerland / Germany



Global Leader in e-Methanol (TRL 8-9)
Carbon Recycling International, Iceland

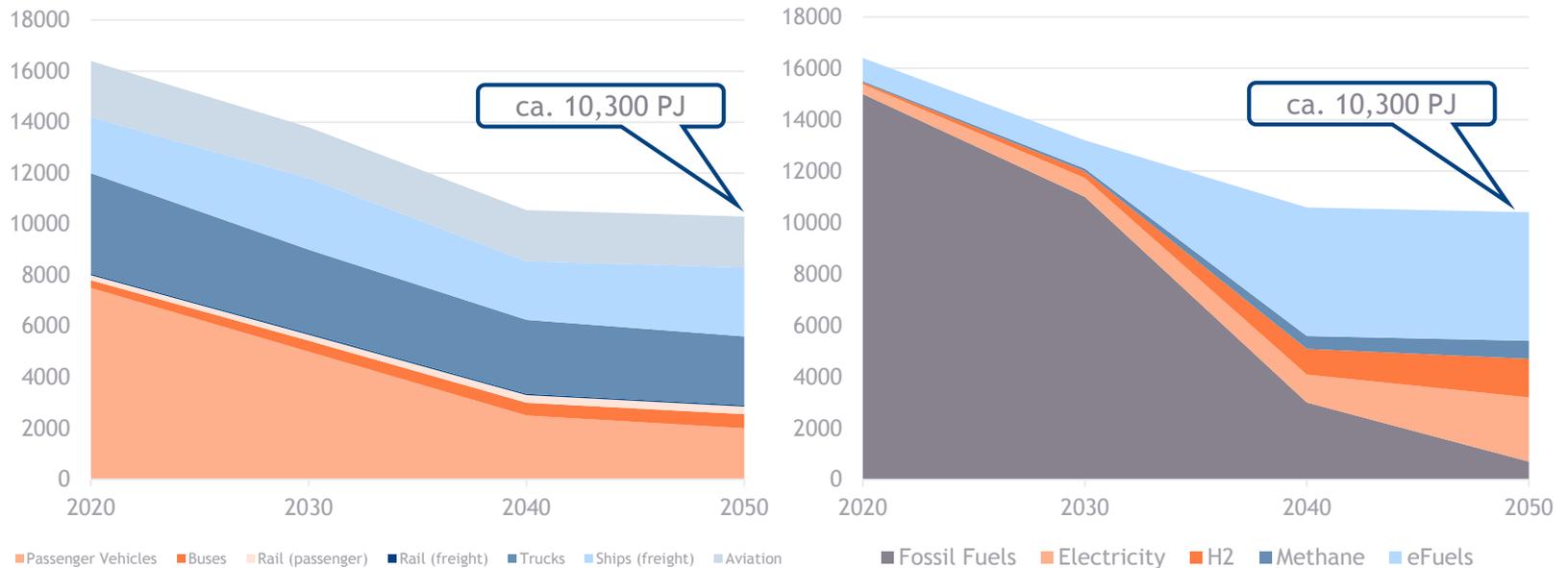


Global Leader in green hydrogen generation (TRL 7-8)
Hydrogenics, Belgium / McPhy, France / ITM, UK



Global Leader in e-Crude (TRL 8-9)
Sunfire and Ineratec, Germany

e-Fuels predicted to play large role in the future



Calculation based on dena/LBST „E-Fuels -The potential of electricity based fuels for low emission transport in the EU”, 2017

- + In 2050, hard-to-electrify sector will make up 50% or 5,000 PJ
- + For e-Fuels to be available in those quantities after 2030, we must start now

Key Positions from Sunfire

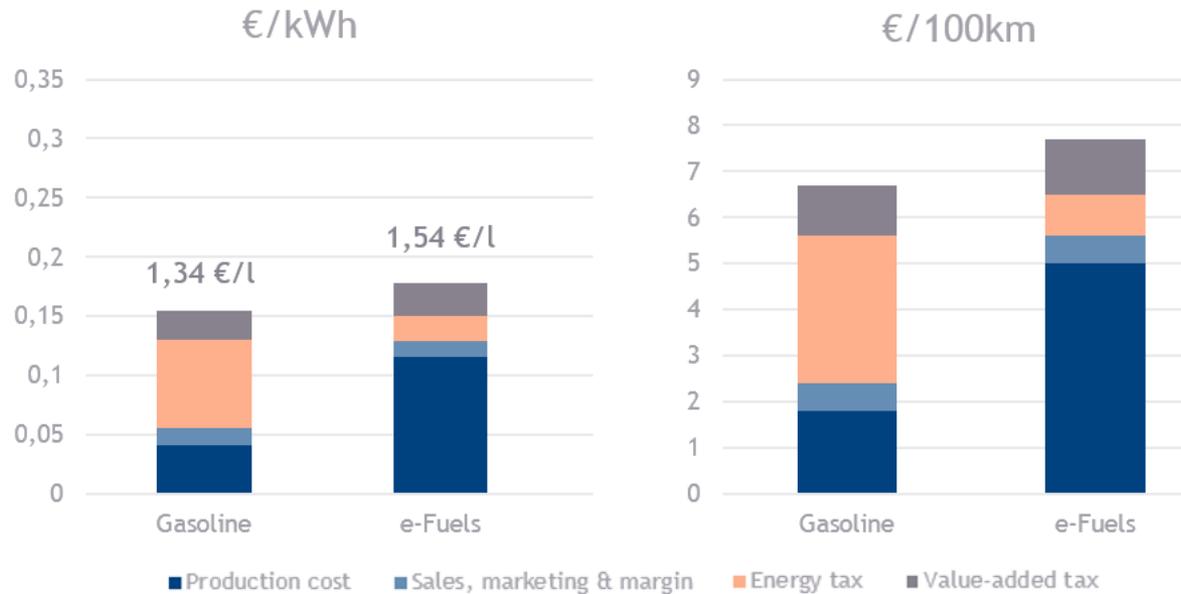


- + Electricity must be renewable - flexible operation allows 100%
- + Key criteria to impose: Full cost coverage, guarantee of origin, time- and space-related reference
- + **Power-Purchase-Agreement + GoO enable all four criteria**
- + Not useful: “Additionality” or “direct connection”



- + Carbon dioxide must come from unavoidable sources
- + CO₂ from coal fired power plants is avoidable!
- + Short-term unavoidable: Steel, chemicals, cement and biogas
Long-term: Direct air capture
- + In both cases atmospheric CO₂ balance is neutral
- + **Create a registry which CO₂ sources are unavoidable**

e-Fuels will be able to compete with fossil fuels



- + 100% e-Fuel will be able to compete with fossil fuels
- + Effect when blended with fossil fuel negligible for end-customers
- + Additional costs compared to battery mobility is 2,000 € / 100,000 km

Key Positions from Sunfire

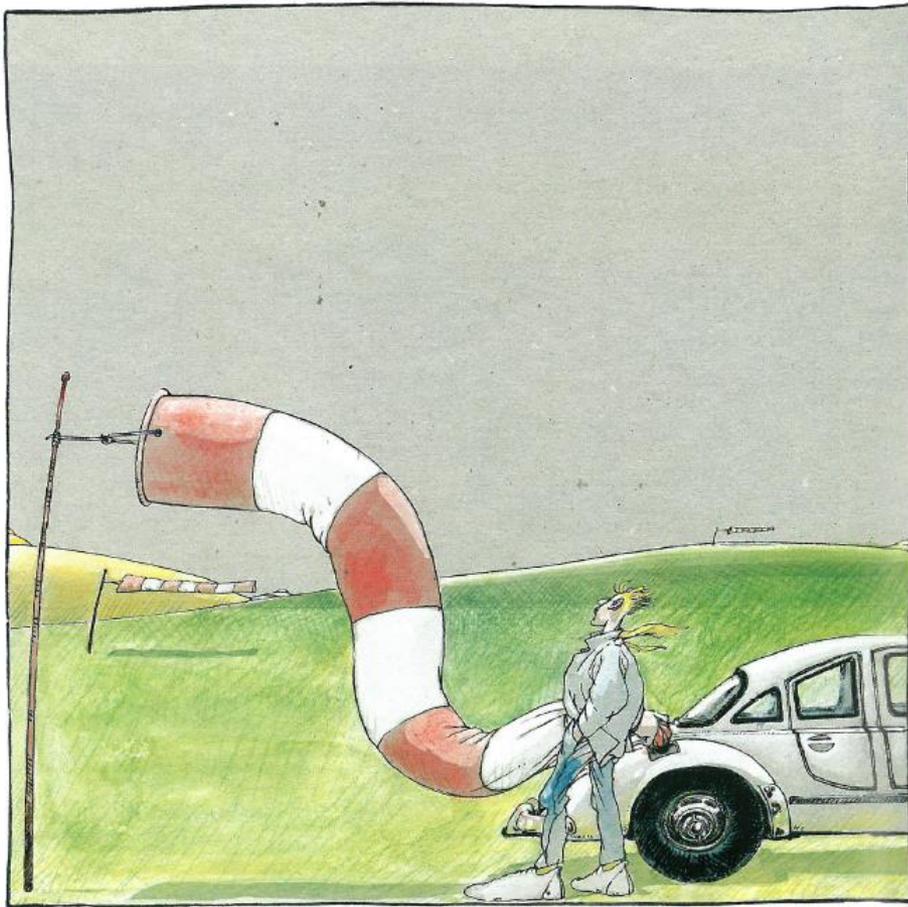


- + Be technology neutral - the plate is full enough for all of us
- + Prevent past mistakes: 2007 (1G biofuel-only) and 2017 (battery electric-only)
- + **Equal footing for batteries, hydrogen, e-Fuels and advanced biofuels**
- + Battery electric mobility is more efficient **for passenger transport**, but requires **additional investment in grid and seasonal storage**
- + **Do not impose unjustified multipliers for any technology**



- + Start with passenger transport, as regulatory framework (RED) exists
- + Switch to aviation, shipping, chemicals, steel, etc. (hard-to-electrify) once legislation is in place
- + **If necessary, impose a maximum quantity in RED II**

e-Fuels put wind and solar power in the tank...



Artist: Jean-Yves Hamel

...Done the right way,
it's a huge opportunity
for Europe!



VIELEN DANK!

E N E R G Y
E V E R Y W H E R E

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