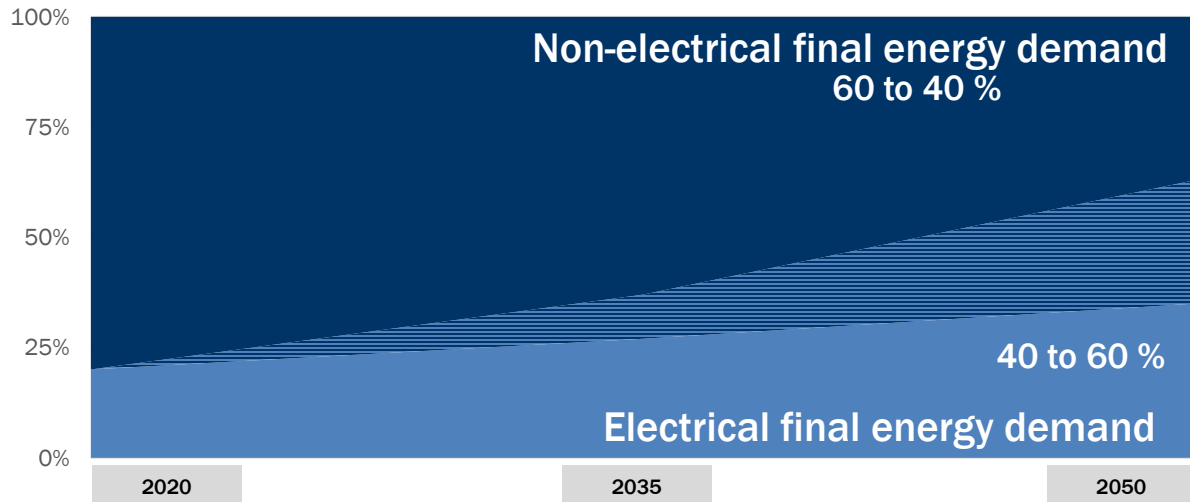


Status Quo and Outlook on PtL Kerosene

Kilian Crone, dena



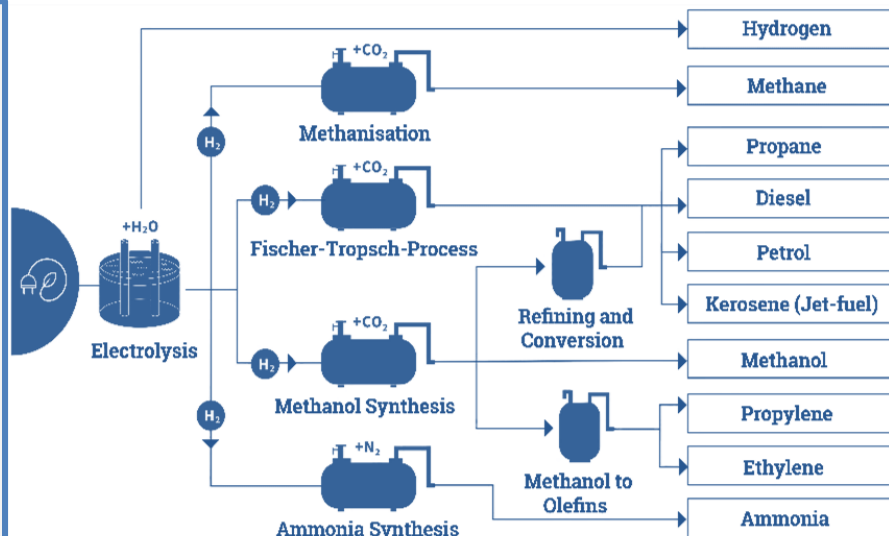
Molecules in the Energy Transition



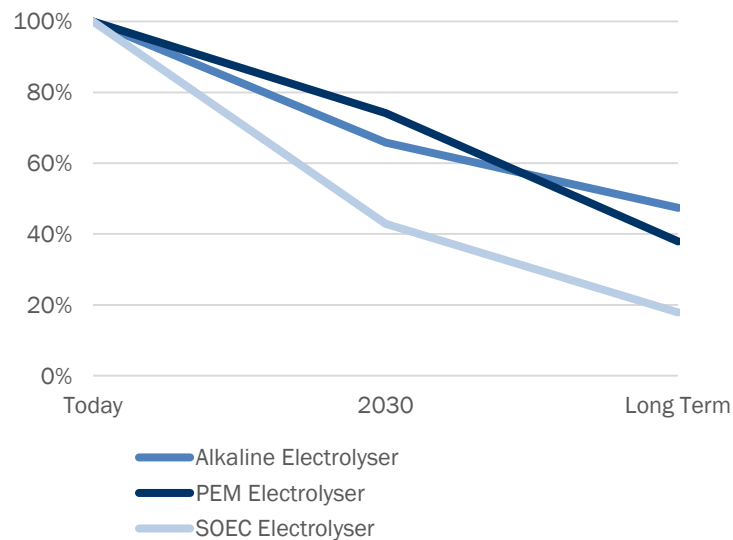
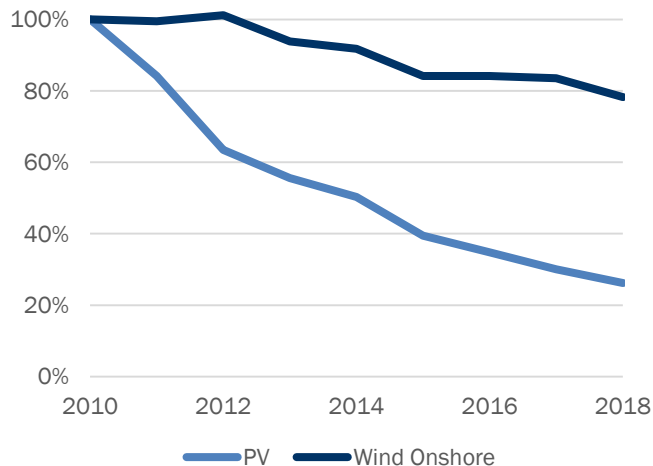
Despite further electrification of final energy consumption, demand for non-electric energy sources remains significant

Powerfuels in the Future Energy System

- Synthetic gaseous or liquid fuels based on (renewable) electricity
- Deliver energy or basic materials feedstock for many use cases
- Are a renewable alternative to fossil resources to avoid CO₂ emissions



Electrolyzer costs follow renewables

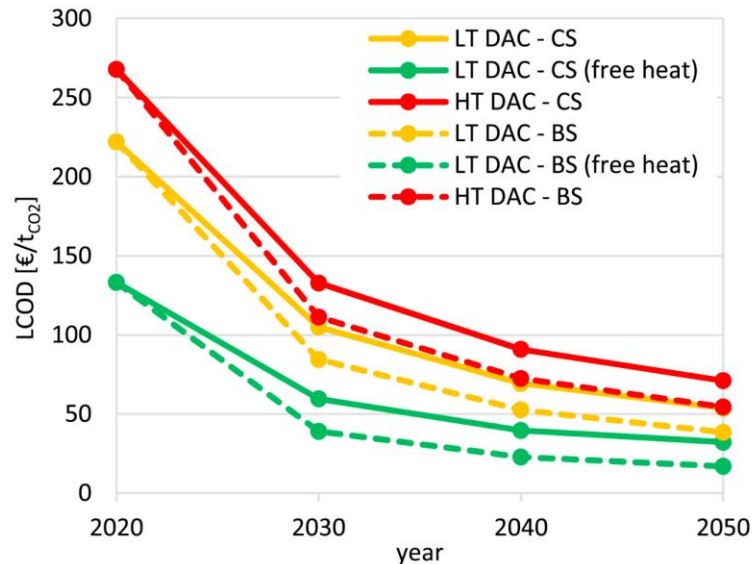


Left: Data from IRENA „Renewable Power Generation Costs in 2018“

Right: Data from IEA “The future of hydrogen” (2019), Averages

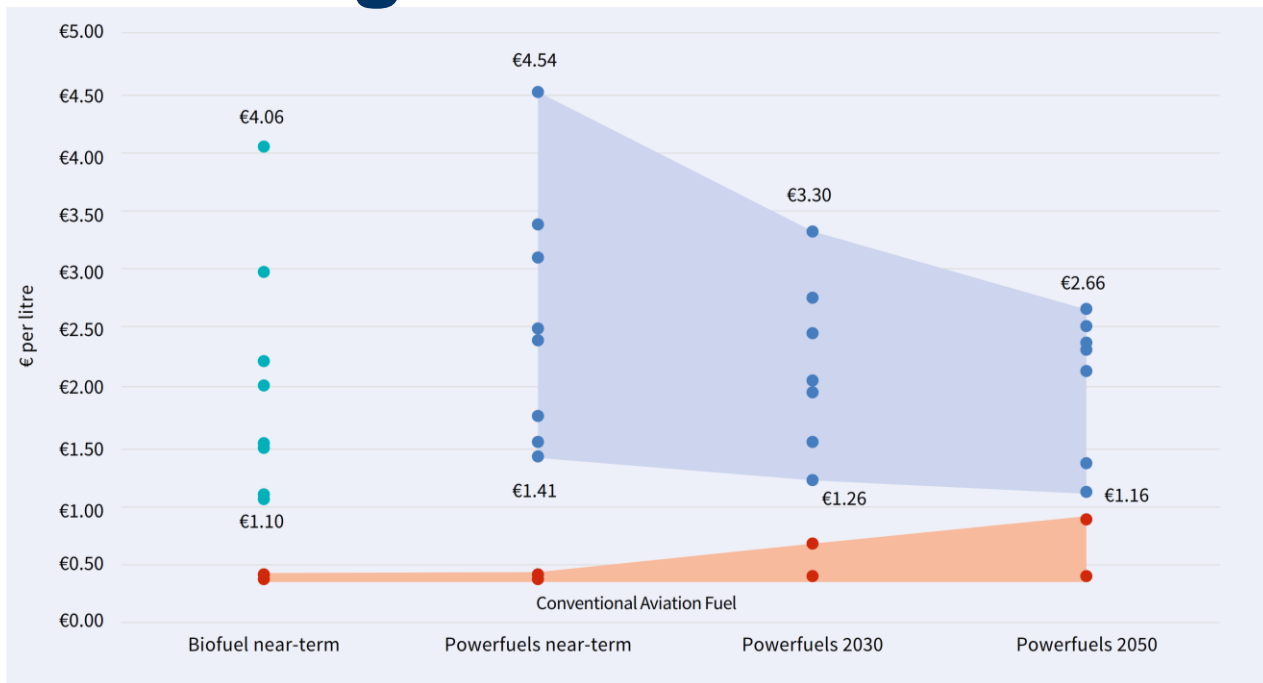
Carbon sources

- Direct Air Capture of CO₂ is the most scaleable option
- Significant cost decreases expected within next 10 years
- Immediate market scale-up should tap into flue gas emissions of industrial and BtL



Source: Mahdi Fasihi, Olga Efimova, Christian Breyer, Techno-economic assessment of CO₂ direct air capture plants, Journal of Cleaner Production, Volume 224, 2019, Pages 957-980

Declining Production Costs

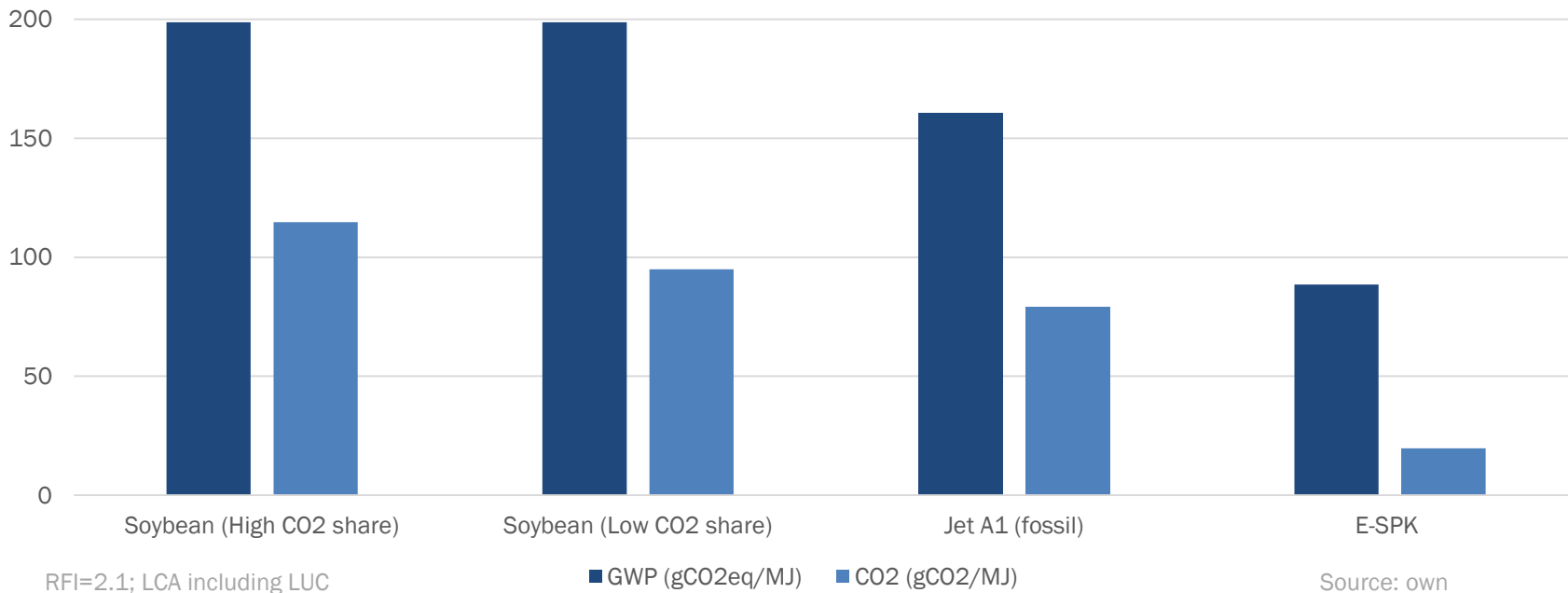


...but price parity can be achieved only with ambitious carbon pricing

Source: Global Alliance Powerfuels „Powerfuels in Aviation“, 2019

Review of 12 recent techno-economic studies

CO₂ and Global Warming Potential



Towards a PtL Kerosene Roadmap

Demonstration

Capital Grants
Operating Subsidies
Applied R&D Funding

R&D plants: Kerosyn100,
PowerFuel

Semi-industrial plants planned:
Rotterdam, Schiphol, Herøya...

Scale-up

Quantity Mechanism
(e.g. Auctions, Quotas)

Wide-scale deployment

Carbon Pricing

E.g. producing 20% of global aviation fuel in South Africa:
250 GW Electrolyzer, 300GW of Wind, 300GW Solar, 2.5% of land area for wind, 0.5% for PV

Source: Enertrag at workshop „The Potential for Powerfuels“, Johannesburg 2019



Conclusion: PtL Kerosene...

- Will be procured at reasonable and falling costs
- Can be produced sustainably at sufficiently large scale
- Demonstrates a range of environmental benefits
- Should play key role in sector scenarios
- Needs stronger presence and clearer policy levers within ICAO frameworks and member states

Global Alliance Powerfuels

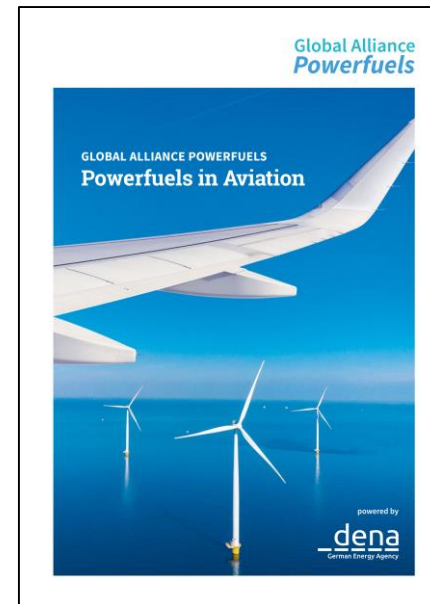


Awareness

Dialogue

Insights

forthcoming



09/2019



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**Thank you for your
attention!**

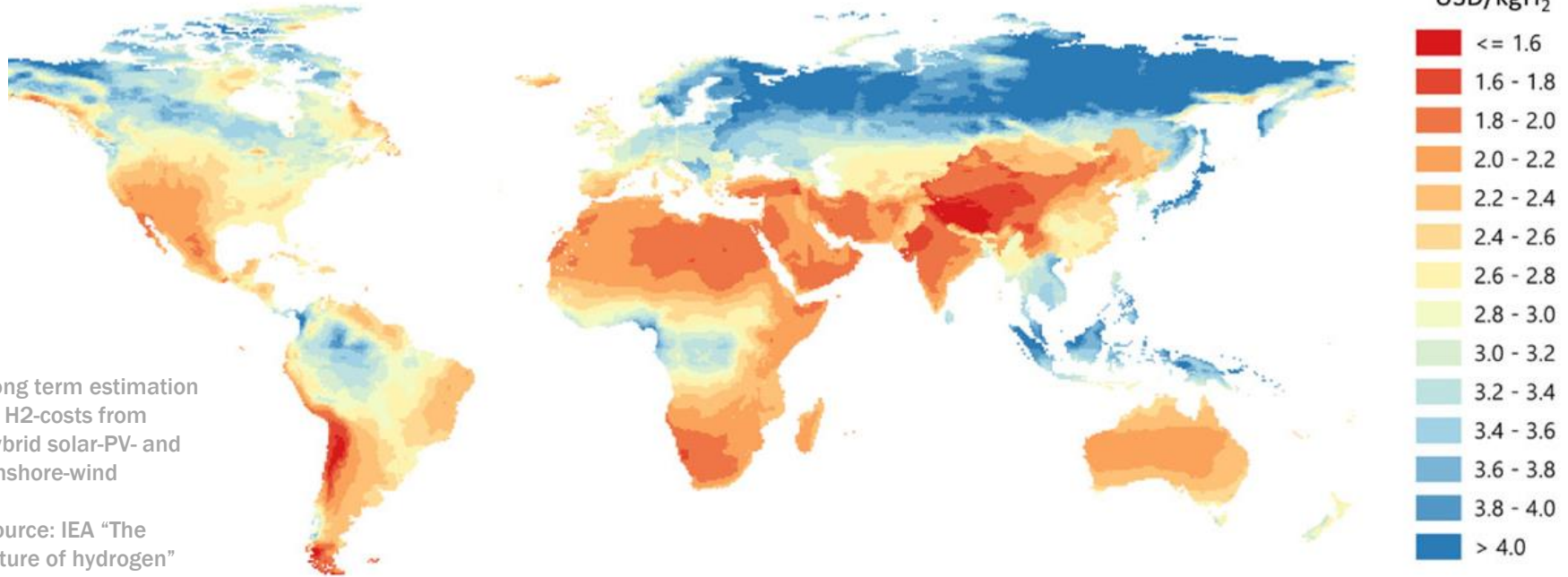
For more information

www.ecac-ceac.org

 @ecacceac



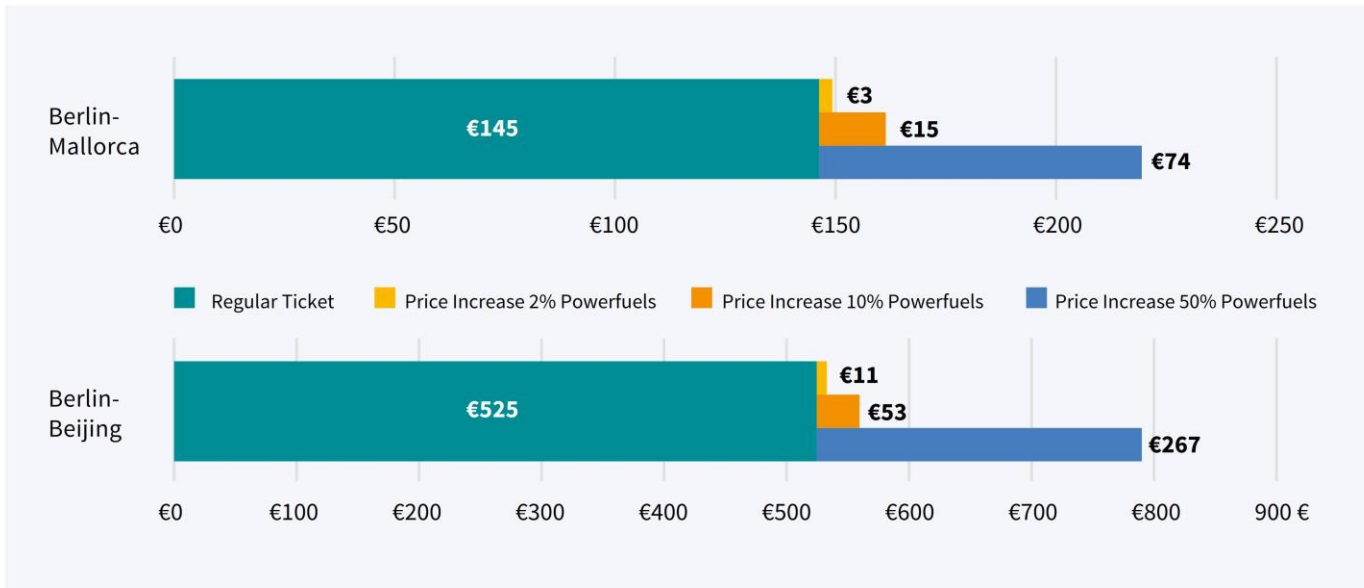
Global Resource Distribution



Long term estimation
of H₂-costs from
hybrid solar-PV- and
Onshore-wind

Source: IEA "The
future of hydrogen"
(2019)

Effects on Ticket Prices



Manageable increase for consumers at lower blends, but substantial premium at higher blends.

Source: Global Alliance Powerfuels „Powerfuels in Aviation“, 2019

Perspective: Short- to medium term
 Assumptions: 2.4€/l or 2836.8€/ton, Fuel cost share 23.5% from IATA Fuel Factsheet (2019)