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Technology Collaboration Programme on Advanced Motor Fuels

SAF production capacities Status and perspectives

INT. CONFERENCE ON SUSTAINABLE AVIATION FUELS

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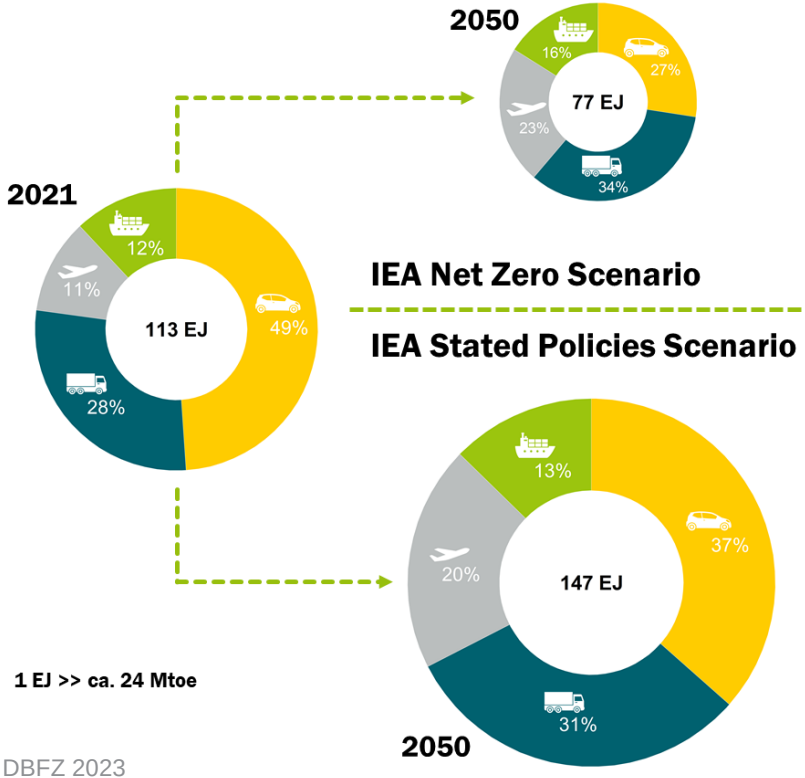
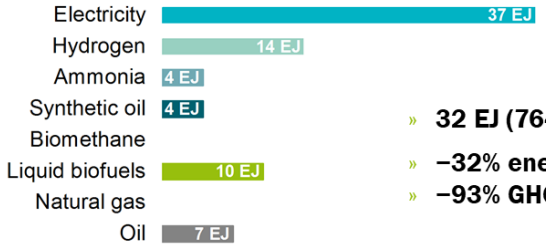
World energy outlook

IEA scenarios

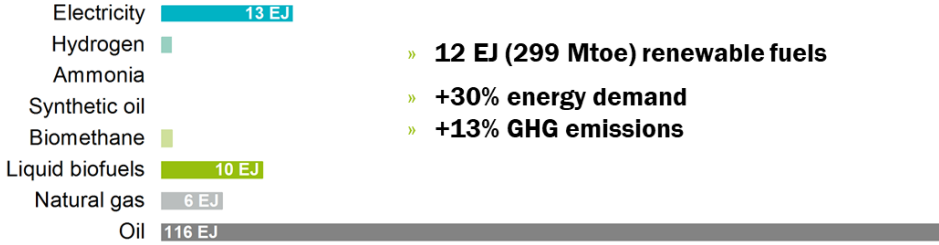




» **32 EJ (764 Mtoe) renewable fuels**

» **−32% energy demand**

» **−93% GHG emissions**



» **12 EJ (299 Mtoe) renewable fuels**

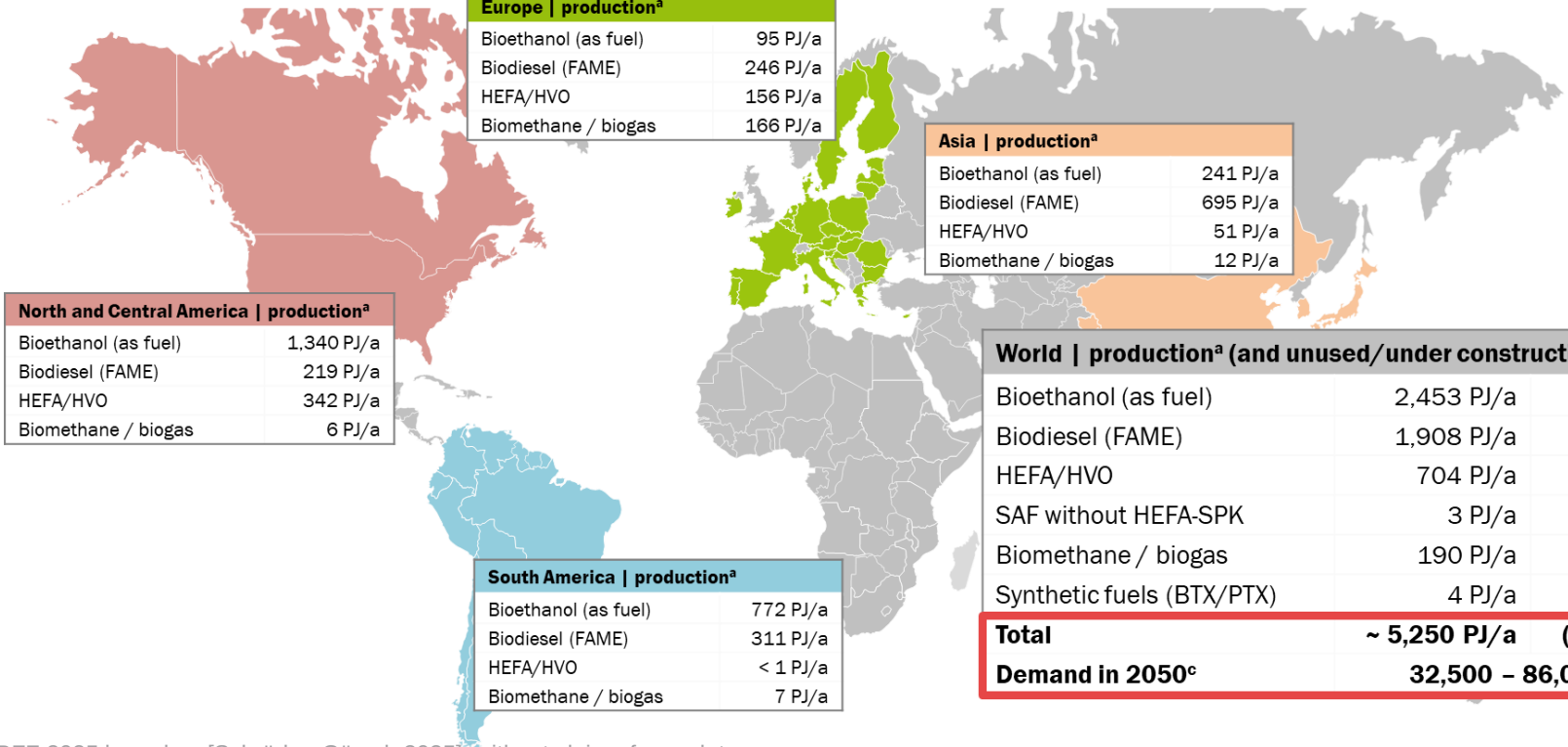
» **+30% energy demand**

» **+13% GHG emissions**

Note: Synthetic oil produced through Fischer-Tropsch conversion or methanol synthesis. It includes oil products from CTL and GTL, and low-emissions liquid hydrogen-based fuels. Liquid fuels derived from biomass or waste feedstock, e.g. ethanol, biodiesel and biojet fuels.

Need of ~10 times more renewables

Capacities of renewable fuels worldwide



Europe | production[a]	
Bioethanol (as fuel)	95 PJ/a
Biodiesel (FAME)	246 PJ/a
HEFA/HVO	156 PJ/a
Biomethane / biogas	166 PJ/a

Asia | production[a]	
Bioethanol (as fuel)	241 PJ/a
Biodiesel (FAME)	695 PJ/a
HEFA/HVO	51 PJ/a
Biomethane / biogas	12 PJ/a

North and Central America | production[a]	
Bioethanol (as fuel)	1,340 PJ/a
Biodiesel (FAME)	219 PJ/a
HEFA/HVO	342 PJ/a
Biomethane / biogas	6 PJ/a

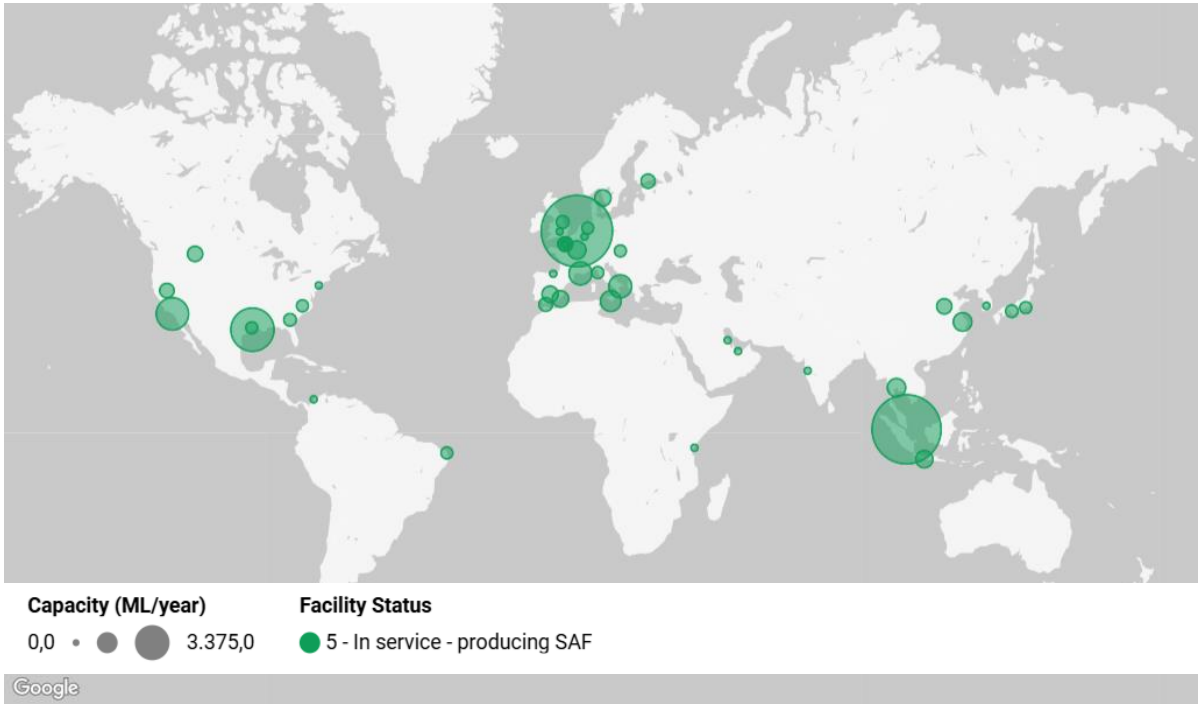
South America | production[a]	
Bioethanol (as fuel)	772 PJ/a
Biodiesel (FAME)	311 PJ/a
HEFA/HVO	< 1 PJ/a
Biomethane / biogas	7 PJ/a

World | production[a] (and unused/under construction/planned[b])		
Bioethanol (as fuel)	2,453 PJ/a	(1,668 PJ/a)
Biodiesel (FAME)	1,908 PJ/a	(1,322 PJ/a)
HEFA/HVO	704 PJ/a	(3,907 PJ/a)
SAF without HEFA-SPK	3 PJ/a	(357 PJ/a)
Biomethane / biogas	190 PJ/a	(N/A)
Synthetic fuels (BTX/PTX)	4 PJ/a	(94 PJ/a)
Total	**~ 5,250 PJ/a**	**(~ 7,350 PJ/a)**
Demand in 2050[c]	**32,500 – 86,000 PJ/a**	

[a] production in 2023 and biomethane capacity in 2024; [b] unused/under construction/planned capacity in 2024; [b] planed capacity; [c] demand according to IEA World Energy Outlook 2021, DNV Pathway to Net Zero Emissions scenario 2023

SAF today

Production capacities

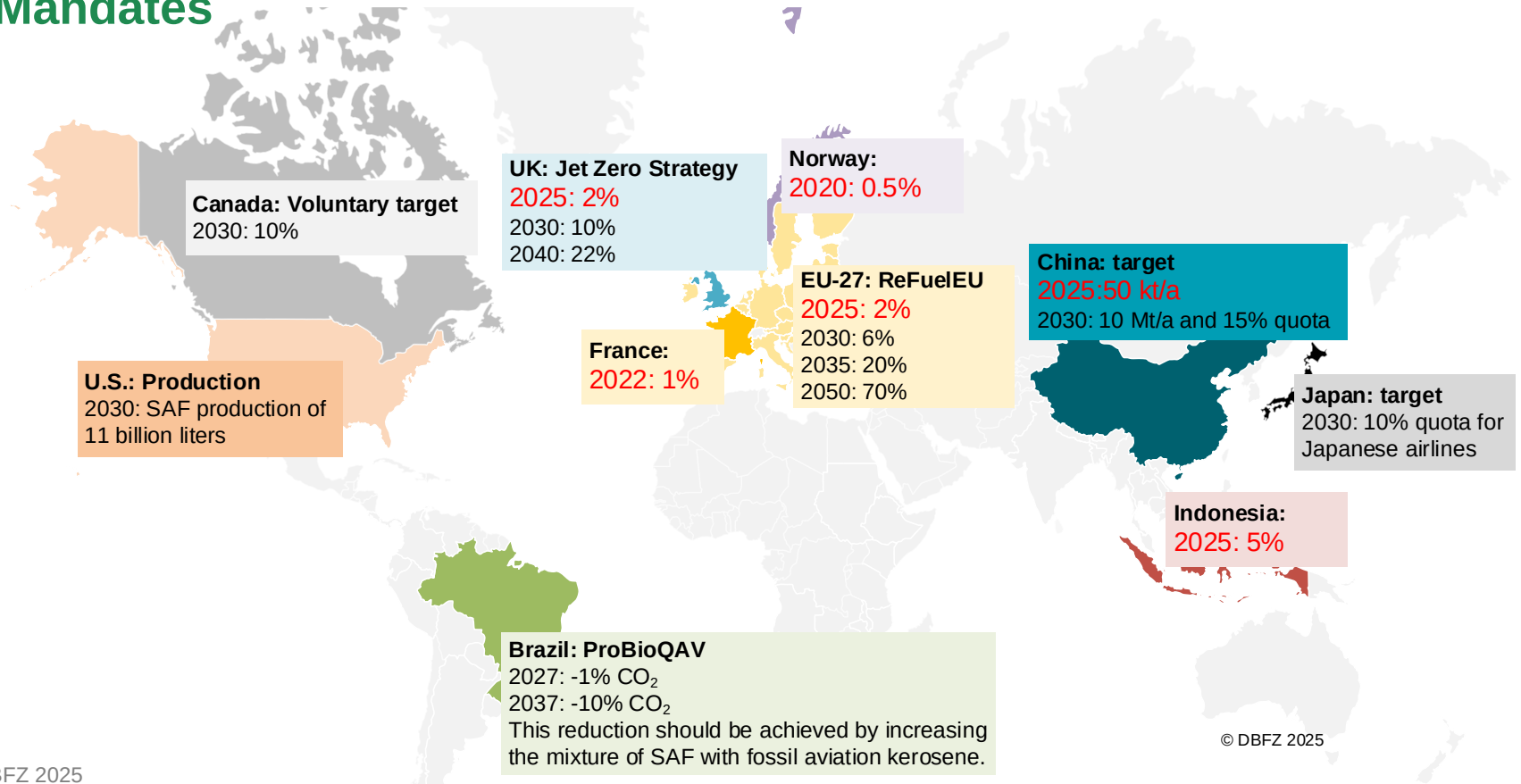


- In 2024, SAF production volumes reached 1 million tonnes
- SAF accounted for 0.3% of global jet fuel production
- HEFA most important process (share > 95%, remaining ATJ and CP-HEFA)
- Average price in 2023:
  Biofuel: 2,768 EUR/tonne
  Synthetic fuel: 7,500 EUR/tonne
  Reference: 816 EUR/tonne
- Average production cost in 2023:
  Biofuel: 1,770 EUR/tonne

Reference: ICAO tracker of SAF facilities, IATA Press release no. 60/2024, EASA 2024 report State of the EU SAF market in 2023

SAF today

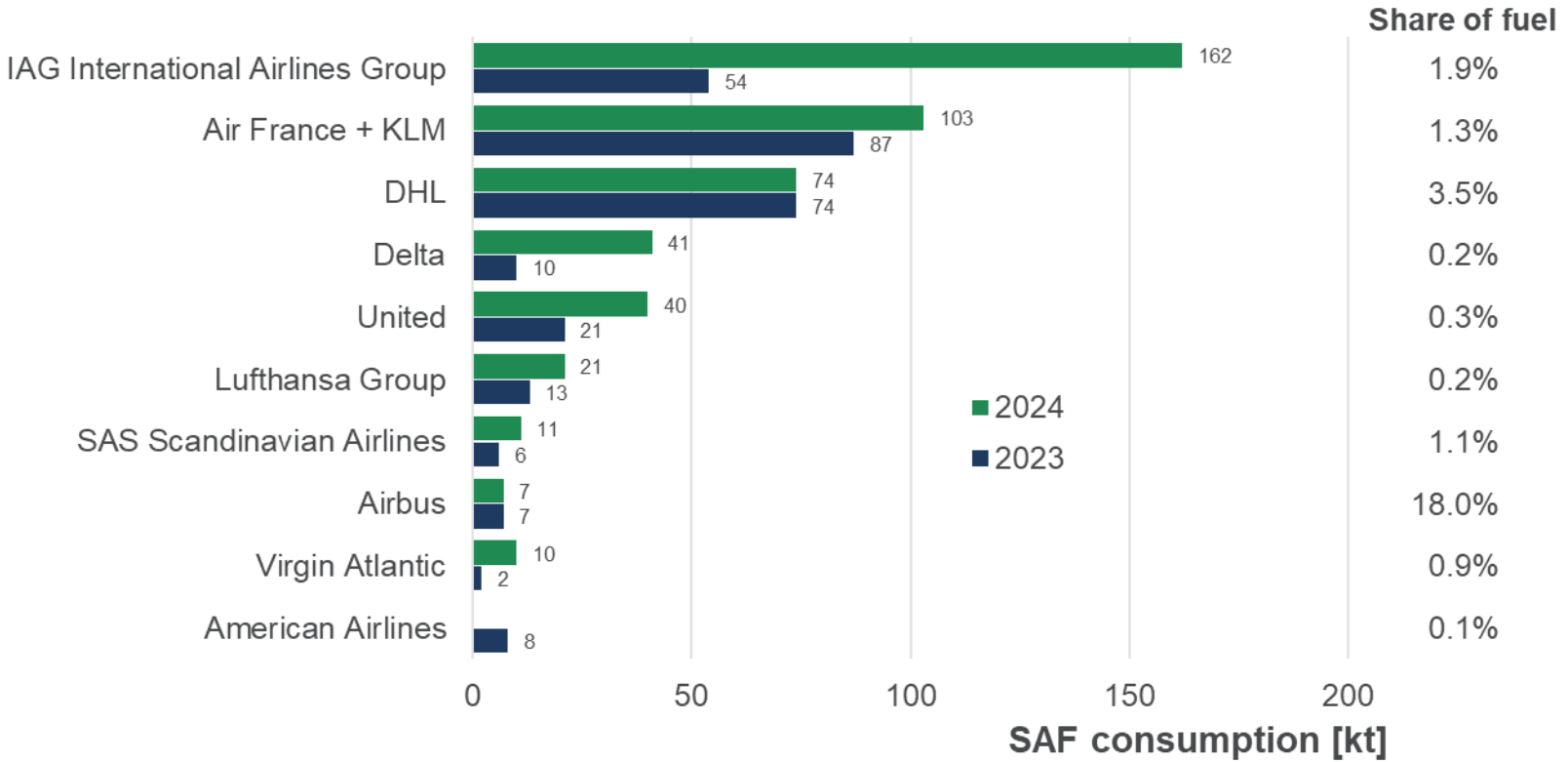
Mandates



Reference: ICAO Environmental Policies on Aviation Fuels

SAF today

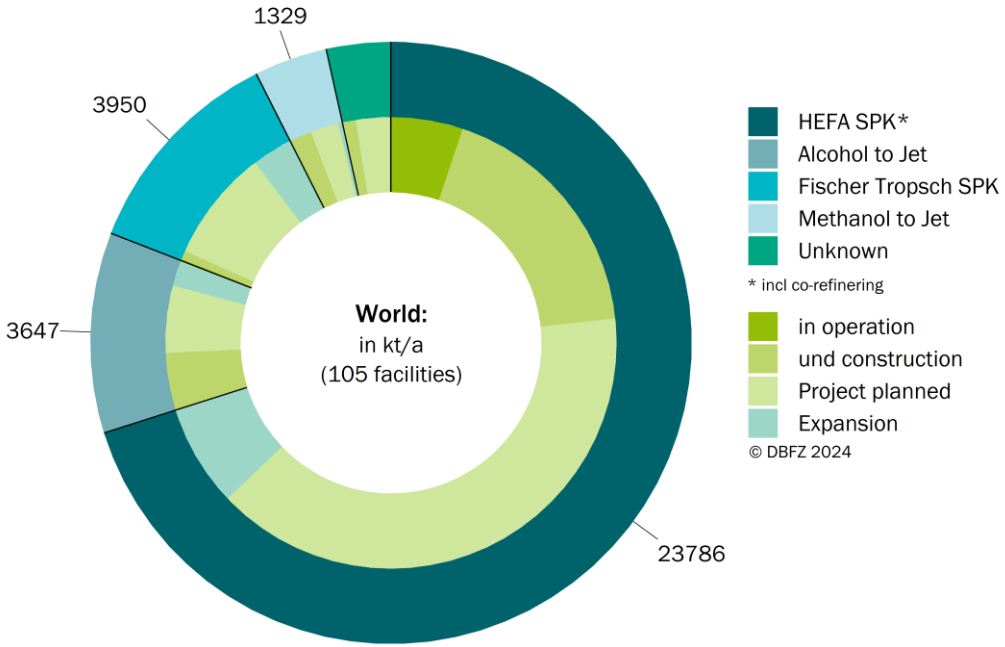
Top SAF users



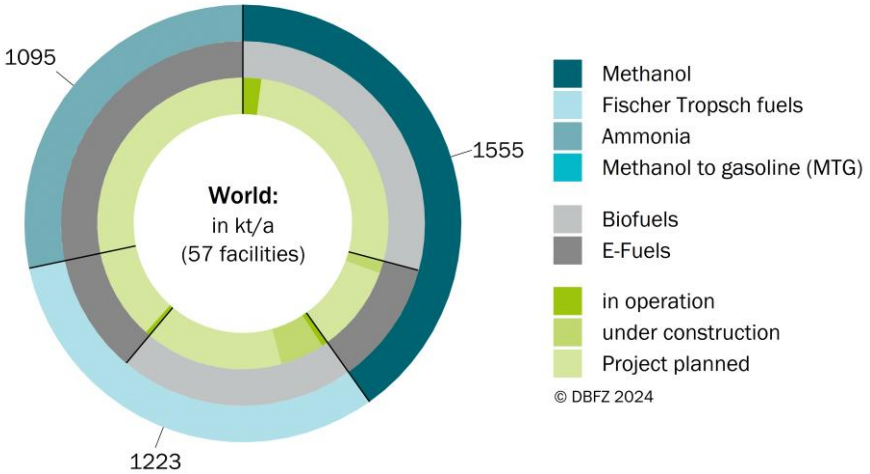
Renewable fuel capacities by 2030

SAF demand as strong driver

SAF



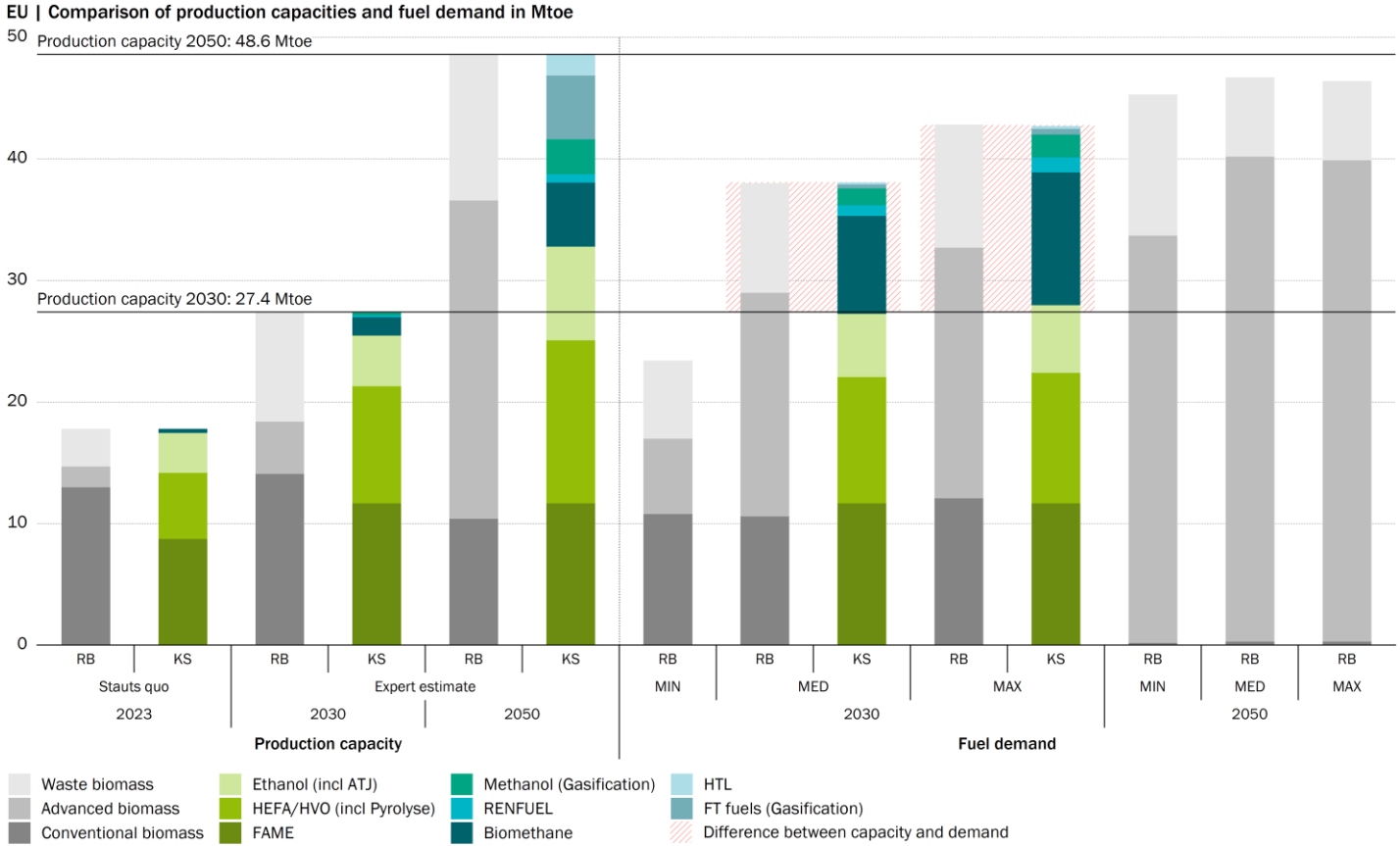
Renewable synthetic fuels (non-SAF)



Reference: [Schröder, Görsch 2025]

Renewable fuel capacities by 2030

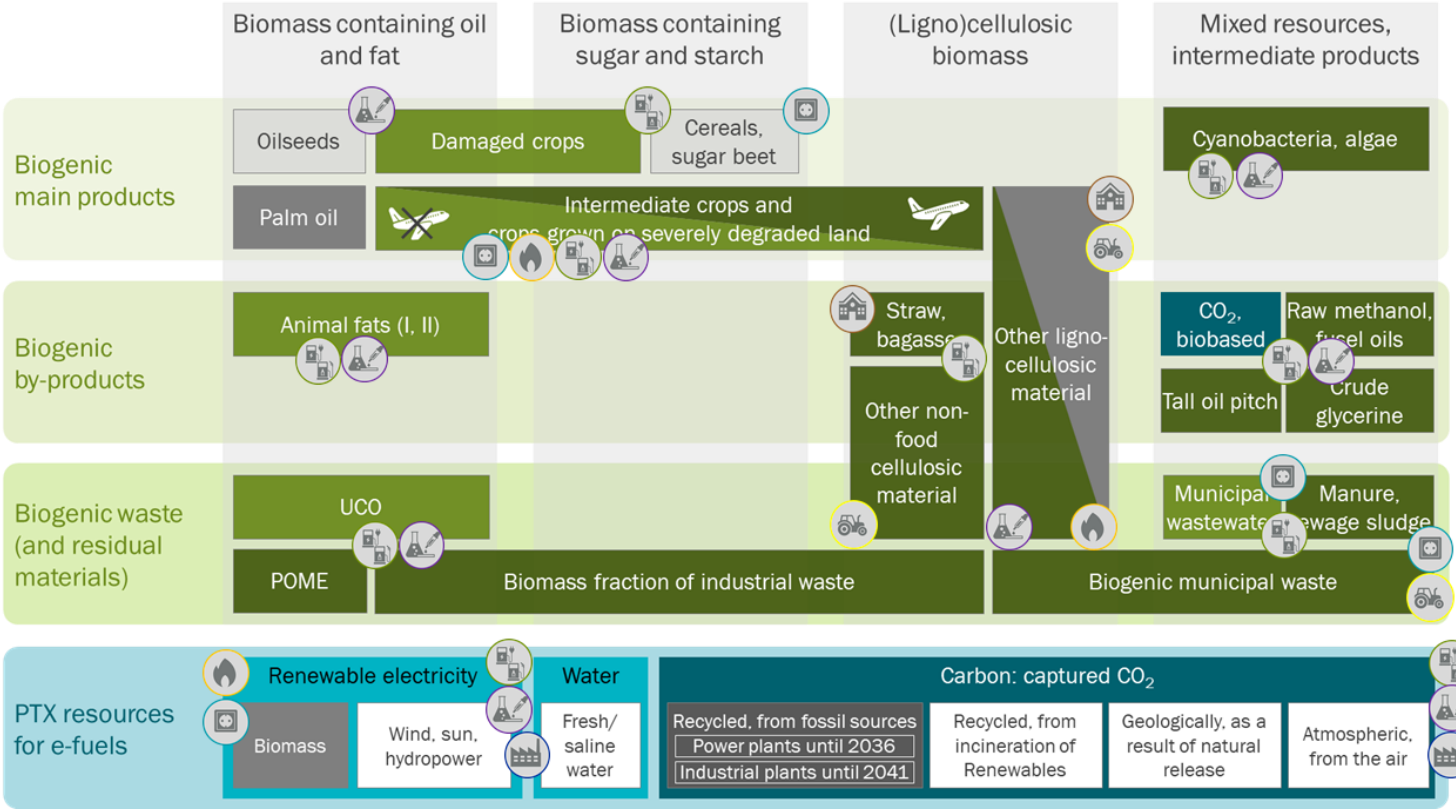
Required capacities esp. for advanced technologies still pending



Reference: [Naumann, K.; Cyffka, K.-F.; Costa de Paiva, G.; Nieß, S.; Neuling, U.; Zitscher, T. (2025): Ressourcen und ihre Mobilisierung. In: Schröder, J.; Görsch, K. (Hrsg.): Erneuerbare Energien im Verkehr. DOI: 10.48480/w11j-9w27], based on European Commission: "Development of outlook for the necessary means to build industrial capacity for drop-in advanced biofuels",
RB – resource base, KS – fuel types

Mobilisation of resources as key

Increasing demand in all sectors by 2030



Already high utilisation rates; e.g.:

- Heat
- Electricity
- Transport
- Chemical
- Construction
- Industry (e.g. steal /cement)
- Agriculture (e.g. peat replacement)

References: Demand icons based on expert assessment. [Naumann, K. et al. (2024): https://www.dbfz.de/fileadmin/user_upload/Referenzen/Statements/Hintergrundpapier_Bio2x_Okt_2024.pdf]

SAF as one strong driver for capacity increase

2024: accounted for 0.3% of global jet fuel production

by 2030: significant gap between expected fuel production capacities and fuel demand including a shift to advanced biomass

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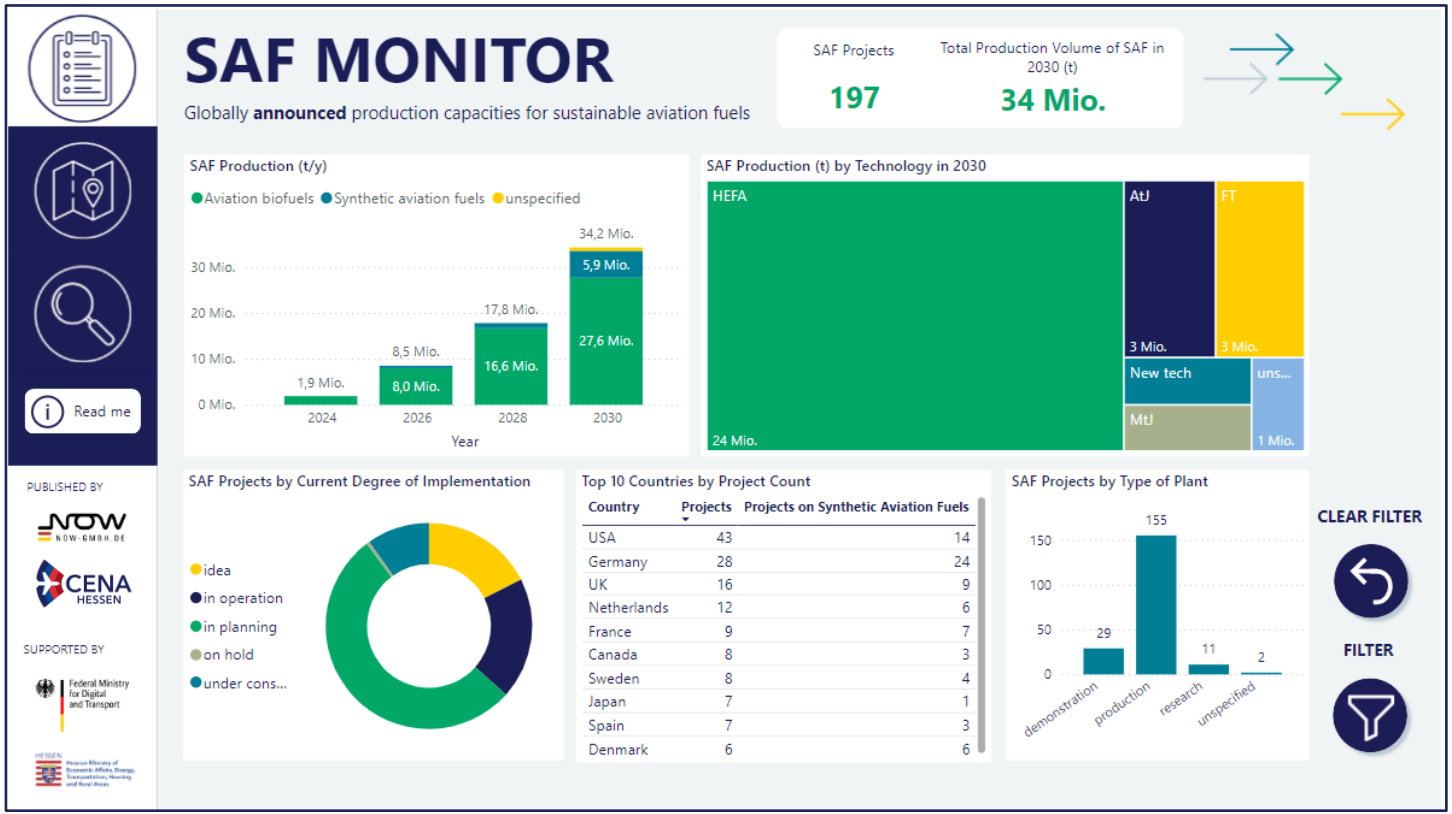
Interesting publication

Outlook: SAF-Monitor

Interactive data base based on the “CENA SAF-Outlook 2024-2030”



SCAN ME

https://www.cena-hessen.de/en/projects/saf-monitor/