

A comparative analysis of SAF policies

ICARUS Project

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Preliminary analysis from the ICARUS Project

The existing policies to support SAF for the EU, Brazil, Canada, China, India and the US were collected and analysed.

A comparative assessment has been done.

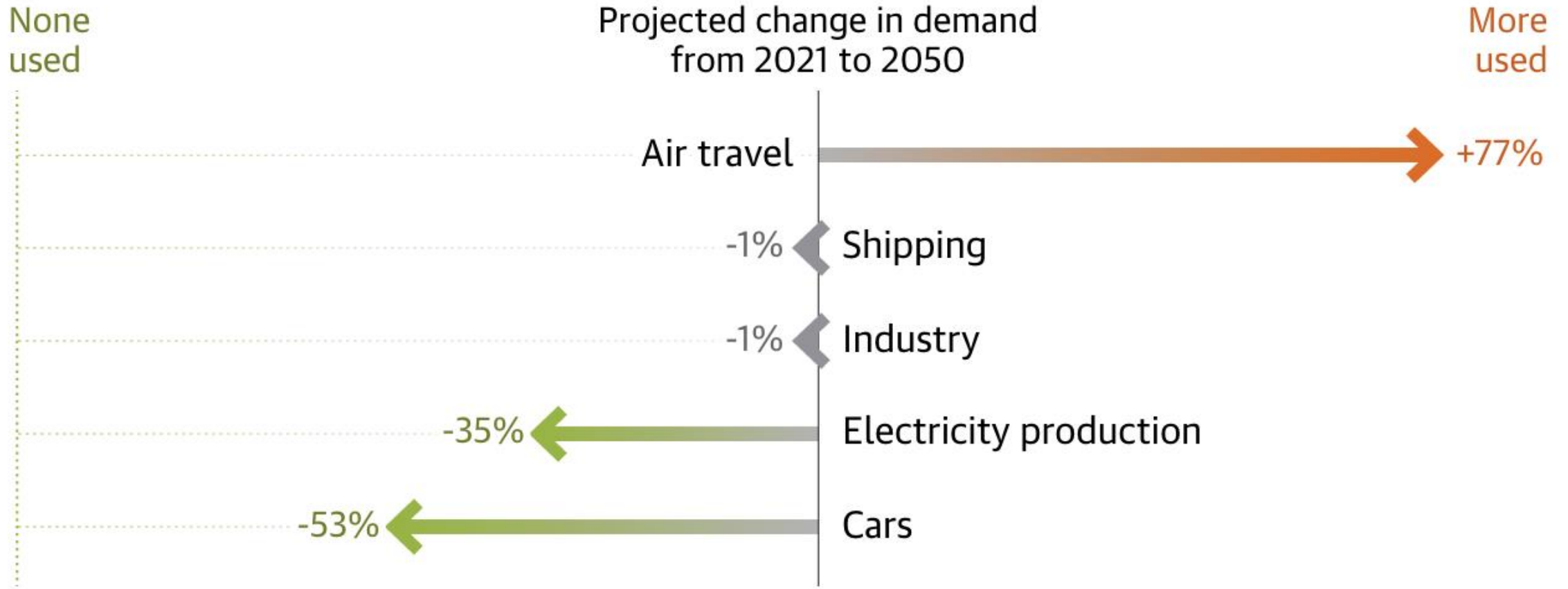
Partners



Associated Partners

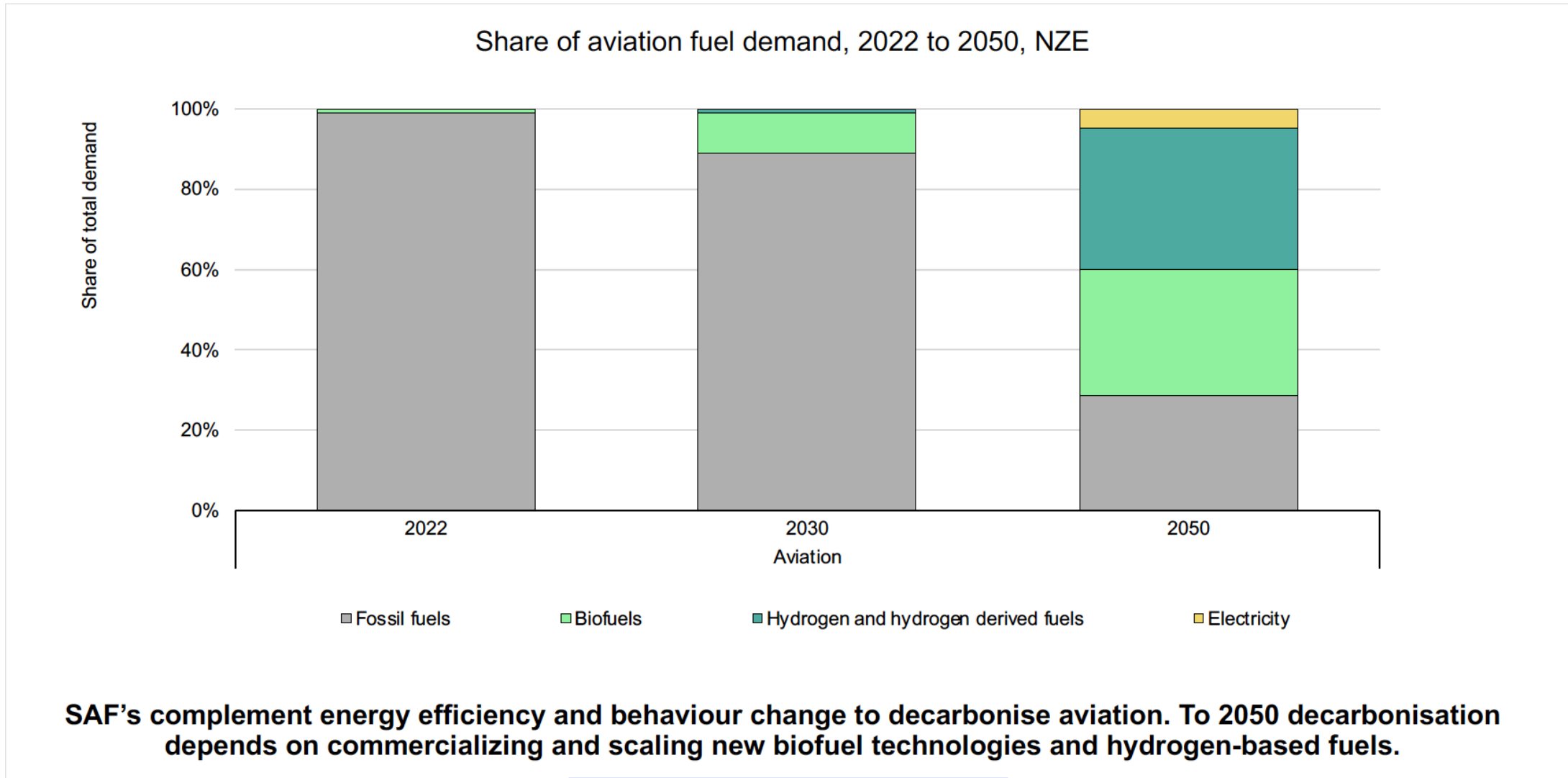


In some sectors, fossil fuel demand isn't decreasing enough



Guardian graphic. Source: Rhodium Group analysis of global fossil fuel demand

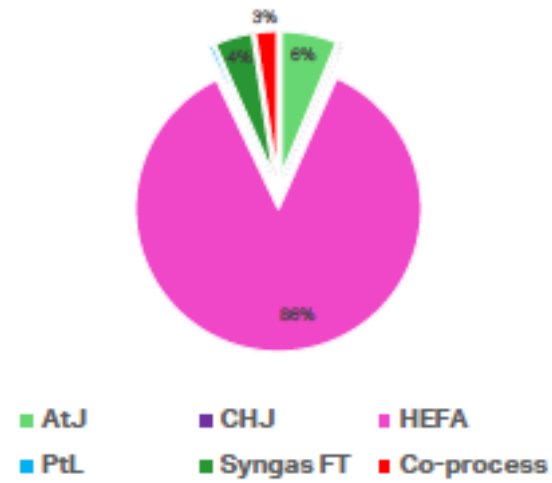
SAF's are crucial to decarbonising aviation on a net zero pathway



At present, it is expected that 85% of future SAF volume over the next five years will be derived from just one of nine certified pathways, HEFA, which is dependent on limited availability of feedstock such as waste fat, oil & grease feedstocks.

Need diversification beyond HEFA pathway*

Total Renewable Fuel Capacity: % Split by Pathway

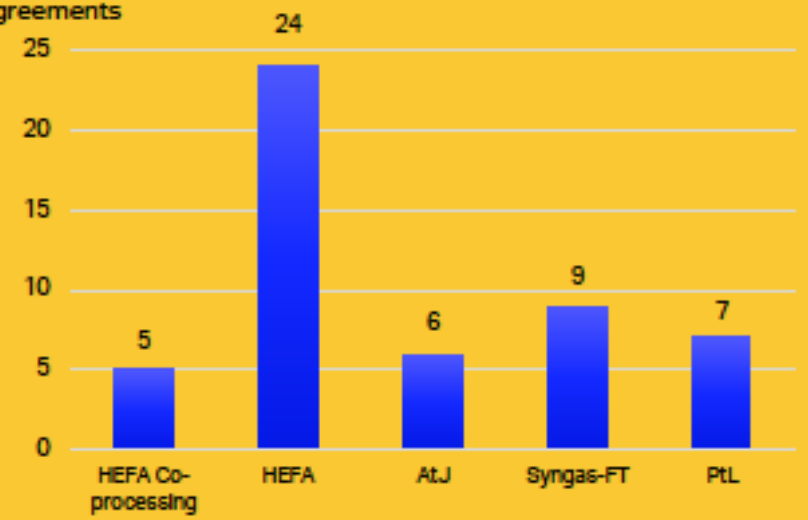


Source: IATA

* HEFA is most mature today but least scalable for future needs

Airline Offtakes starting to address this

Number of agreements



Source: IATA

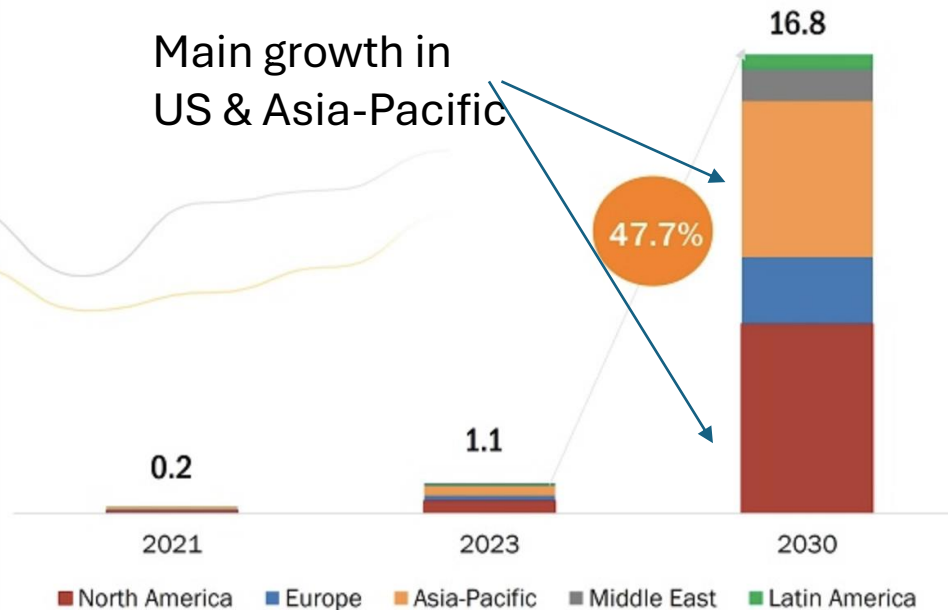
SUSTAINABLE AVIATION FUEL MARKET GLOBAL FORECAST TO 2030



CAGR OF
47.7%

The global sustainable aviation fuel market is expected to be worth USD 16.8 billion by 2030, growing at a CAGR of 47.7% during the forecast period.

Main growth in
US & Asia-Pacific



Markets and Markets **16.8 billion\$ by 2030**

CARG: Compound Annual Growth Rate.

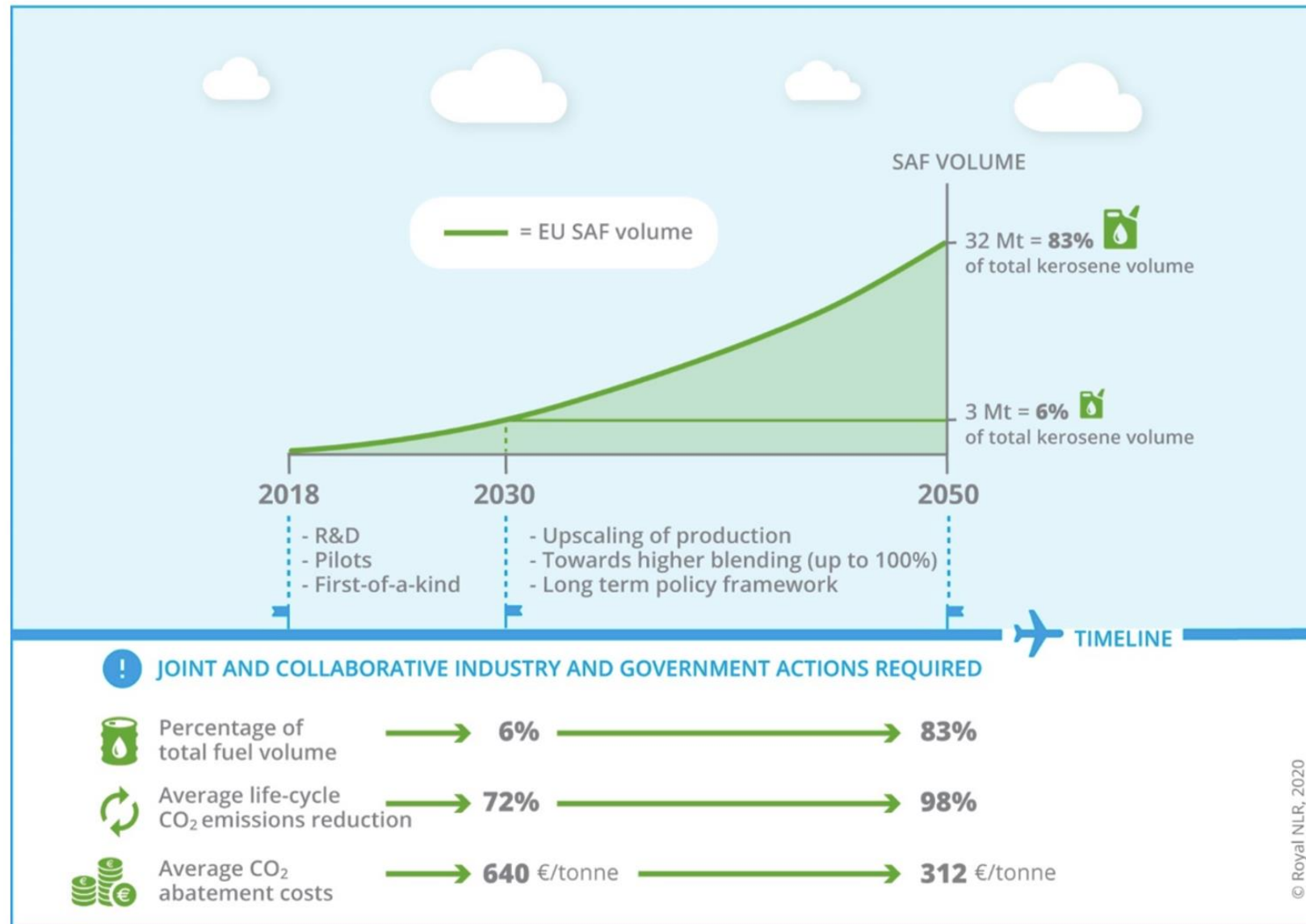
In 2023, the sustainable aviation fuel (SAF) market was valued at USD 1.3 billion, with projections suggesting it will soar to **USD 41.6 billion by 2032**, boasting a compound annual growth rate (CAGR) of 46.9%, reported Flight Training News.

Bioenergy Times

SAF Market to Surge Five-Fold to **Near \$4 Billion by 2028**

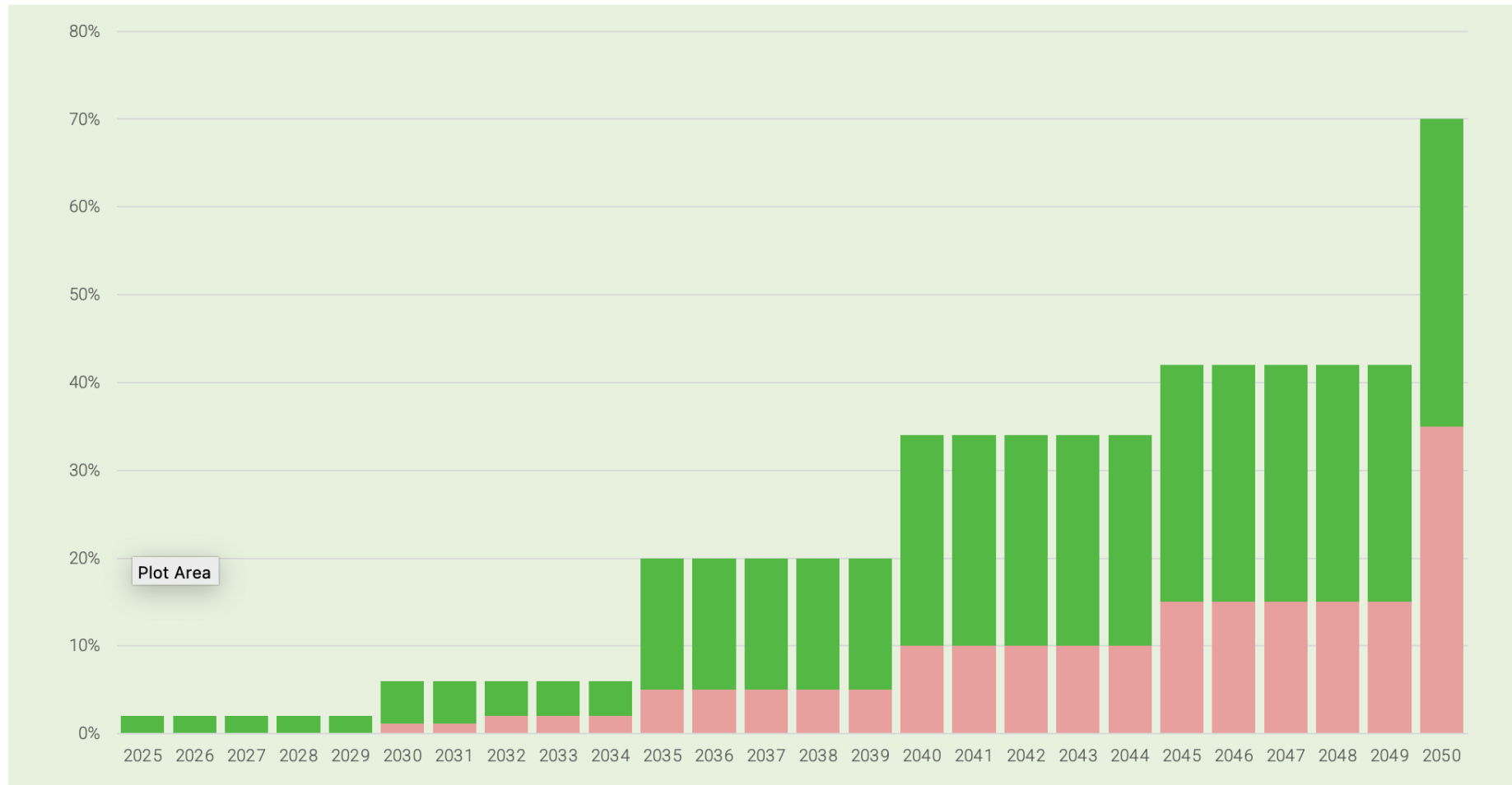
Resource wise

... and strong growth required for Sustainable Aviation Fuels

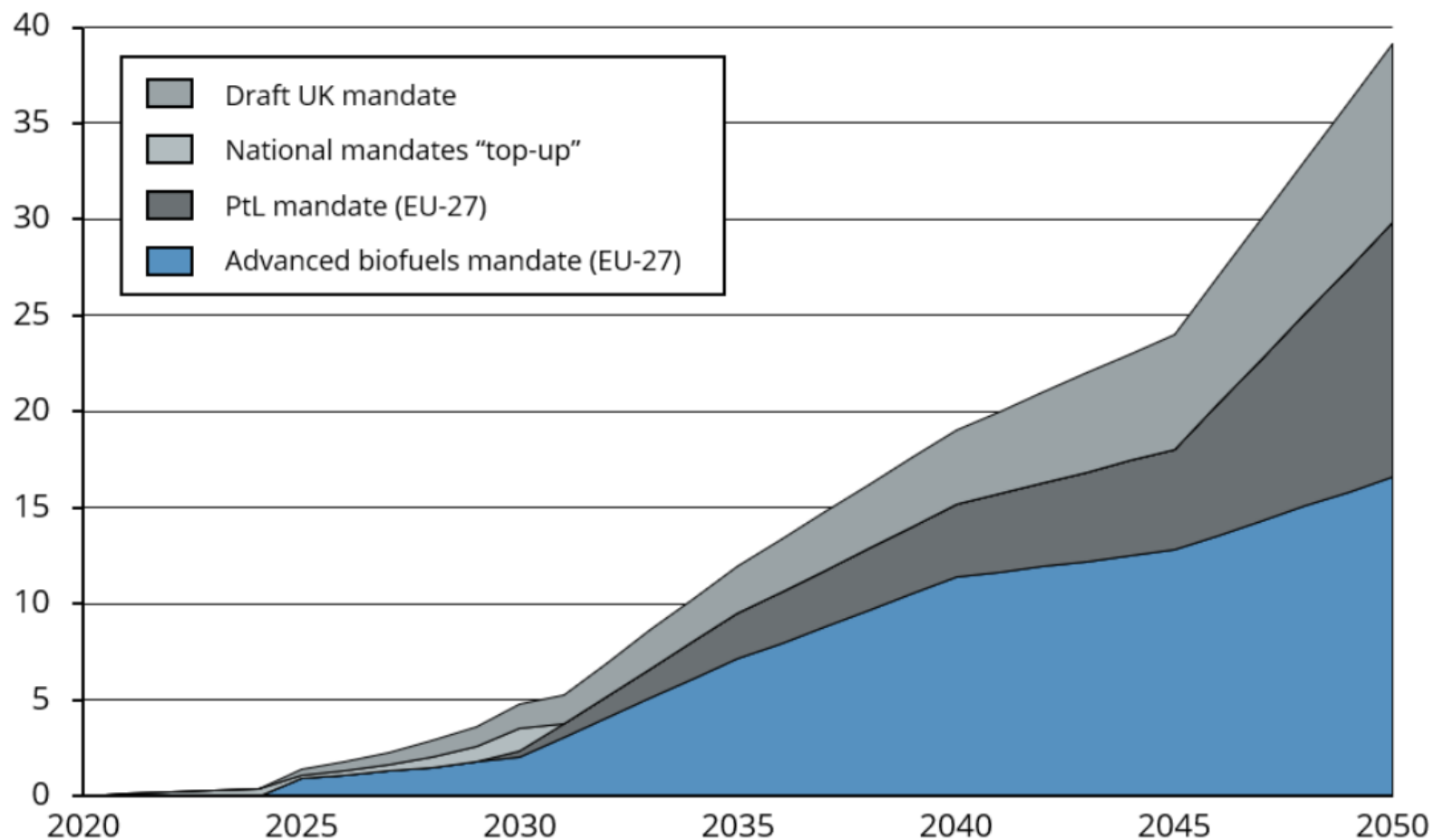


Source: NLR, SEO, 2021, [Destination 2050, A Route To Net Zero European Aviation](#).

EU mandates blending volumes for SAF, in pink the sub-mandates for e-SAF



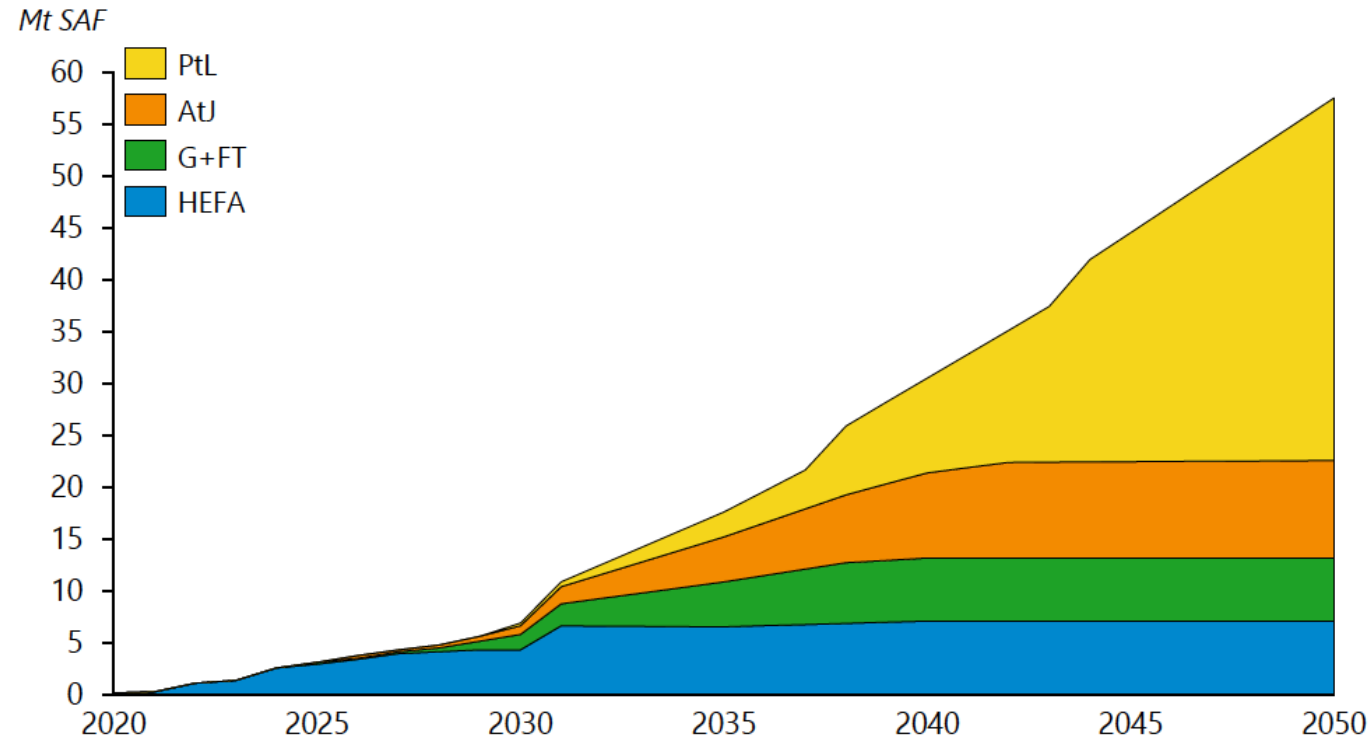
To meet the aggregate demand from EU and UK mandates and the additional demand expected from national mandates, a SAF supply of 4.7 Mt in 2030 and 39.1 Mt in 2050 is needed⁶.



2030 4.7 Mt
2050 39.1 Mt

SkyNRG

Please note: Graph does not include voluntary SAF commitments from airlines and corporates



Total modelled SAF output, incl. announced plants, adapted from World Economic Forum Clean Skies for Tomorrow initiative. NB: aim of this study was to show the maximum potential supply of SAF as input to EU mandate discussions.

¹ WEF CST, Guidelines for a Sustainable Aviation Fuel Blending Mandate in Europe, 2021 ([link](#))



SAF Policies and support actions in the EU, Brazil, Canada, China, India, USA and UK

Region/Country	Key initiatives	Type	Comments
EU	ReFuelEU Aviation Regulation, legislation	Legislation & Mandates	Complex legislation in relation to feedstocks. Mandate targets very ambitious and in short time. High GHG minimum targets. Obligation is upon the fuel suppliers. Mandate targets also on eSAF; nuclear included.
Brazil	Policy on forthcoming mandate	Mandate	Forthcoming mandate set for 2027 aiming to reduce Brazil's aviation emissions by 1% of the sector's total emissions in 2026. Strong relationship to the ethanol route for SAF.
Canada	Policy on targets	Target	1 billion litres of SAF by 2030. By 2035, Canada should be ready to produce SAF to meet 25 percent of total jet fuel demand.
China	Short term goal for biofuel uses in aviation	Target	Cumulatively consuming 50,000 tons of SAF by 2025. No reference yet to sustainability certification. No relationship to ASTM, thus need to develop own standards.
India	Policy on forthcoming mandate	Mandate	Use of 1% SAF for domestic airlines by 2025. The policy also aims to support farmers and rural job creation.
USA	Sustainable Aviation Fuel tax credit, legislation	Production Target	Expand production to achieve 3 billion gallons (11.4billion litres) per year of domestic SAF production that achieve a minimum of a 50% reduction in life cycle GHG emission compared to conventional fuel by 2030. Strong support for new types of feedstock development. Loan guarantees.
UK	Policy on forthcoming mandate	Mandate	Plans unveiled (25/04/2024) for world leading sustainable aviation fuel mandate, with 10% of all jet fuel set to go green by 2030. Needs parliamentary approval, will come into force in January 2025.

Stong policies but....Dark clouds ahead

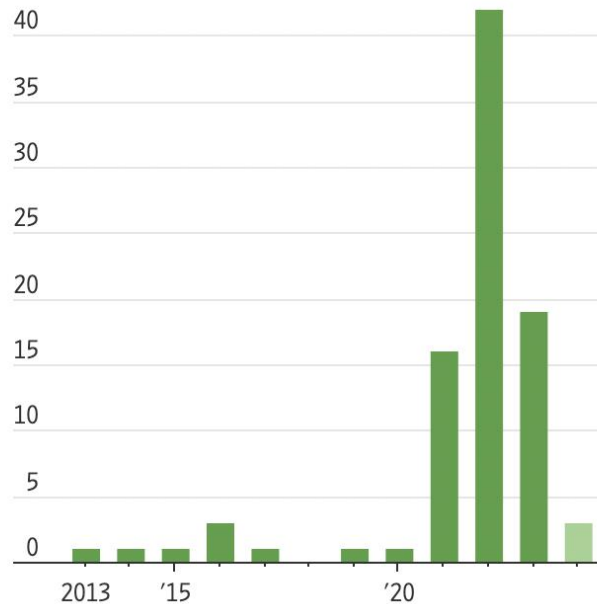
The U.S. and Europe Can't Agree on What Counts as Sustainable Aviation Fuel. That's Leaving Investors in a Bind.

Confusion swirling against a backdrop of failed investment in the alternative fuel industry

WSJ, 24/06/2024

Purchase Agreements Are Stalling

45 offtake agreements

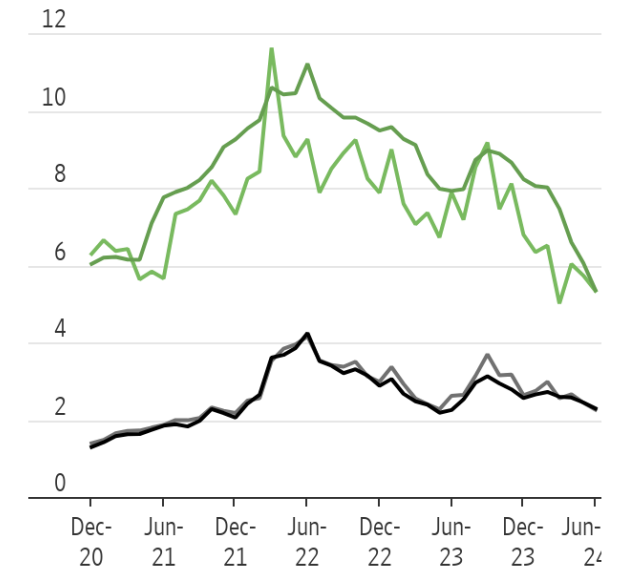


Source: Argus Media

Sky-High Prices

■ European SAF ■ U.S. SAF
■ EU Jet Fuel ■ U.S. Jet Fuel

\$14 a gallon



Source: Argus Media

Emphasis in the US to invest in corn and soybeans...

Emphasis in the EU to invest in synthetic fuels....

LanzaJet, the Renewable Fuels Association, and other U.S. ethanol groups have filed to join a lawsuit brought by EU ethanol producers challenging ReFuelEU.

Fulcrum BioEnergy shutter Nevada waste-to-SAF facility, CEO departs

The company once claimed it was the first to launch a commercial waste-to-SAF facility. Now, Fulcrum has laid off workers as its funding dries up.

Published June 5, 2024

<https://www.wastedive.com/news/fulcrum-bioenergy-sierra-biofuels-reno-nevada-shutdown-eric-pryor/717916/>



350 ktpa MSW → 175
ktpa feed

Status: Plant has been
commissioned. Several
runs completed.

Costs ~ 1 bnUSD

Shell to take hit of up to \$2bn on Rotterdam and Singapore sites

Oil firm's warning comes after it had to halt work on Europe's largest biofuel project and sell refinery in Asia

Published 5 July 2024

<https://www.theguardian.com/business/article/2024/jul/05/shell-to-take-hit-of-up-to-2bn-on-rotterdam-and-singapore-sites>

Shell announced that it had “temporarily paused” the construction of a big biofuel plant in Rotterdam, which was expected to convert waste into green jet fuel and biodiesel by the end of the decade.

The oil company's biggest energy transition project has struggled with technical difficulties that have delayed its progress so far. It had expected to start producing up to 820,000 tonnes of biofuels a year in April, before this was pushed back to 2025.

Preliminary conclusions

- At present only the EU and US have enacted legislation for the deployment of SAF.
- Mandates have been adopted in the EU and are planned in Brazil and India while Canada, China and the USA are basing their policies on volumetric targets.
- Only the EU has a specific mandate for eSAF and this also includes hydrogen from nuclear electricity.
- There is strong reference to develop new crops in Canada, India, and USA to ensure that biomass resources will be available to meet the production targets.
- USA has clear and specific loan guarantees to support the deployment of SAF facilities in the USA.
- India, further prominently considers support to farmers and improving local employment.
- Policies in China do not refer to sustainability certification. There is no relationship with ASTM so China must develop its own national SAF standards and certification.
- Investors remain however on the edge.