



Sustainable Fuels for Aviation



Aviation Initiative for
Renewable Energy in Germany e.V.

- Founded in 2011 as an association of companies and organizations from industry, research, and science
- Availability and use of renewable energies in aviation in order to achieve the aviation industry's ambitious CO₂ reduction targets



What does aireg stand for?

Reliable regulatory framework

Consistent commitment to European regulation, in particular the SAF mandates of the ReFuelEU Aviation Regulation, as a key instrument for supporting the market ramp-up of sustainable aviation fuels (SAF).

Ambitious target achievement

Exceeding the specified SAF mandates for climate protection reasons and to actively support the ICAO's international climate targets in the area of sustainable aviation fuels.

Strengthening incentive systems

Further development and expansion of market-effective support and incentive mechanisms for the broader use of SAF in German and European aviation.

Reliable and sustainable value creation

Establishment of import structures for hydrogen derivatives to Germany in order to fulfill SAF mandates, while ensuring that a significant portion of industrial value creation remains in Germany—with the aim of securing technological leadership and strengthening national energy and supply sovereignty.

58 Members

Cooperation Agreements



Memberships



- Strategy paper published for ILA 2024 – Germany as a leading market for sustainable aviation fuels (SAF)
- aireg sees itself as a competence network and open transformation platform whose members can be classified into four subject areas (Aviation; Fuel Producers; Research, Development & Consulting; Policy) and develop new approaches and innovative concepts for achieving the ambitious usage targets for SAF



Organizational Structure

General Assembly

Executive Board
Six members of the Board

Advisory Council
Advisory Council members from science, industry and politics

Coordinating Committee
Consisting of the Executive Board and the chairs of the WGs

Auditors and Head Office

Our Executive Board



Siegfried Knecht
Chairman of the Board



Uwe Gaudig
Deputy Chairman of the Board



Prof. Dr.-Ing. Martin Kaltschmitt
Deputy Chairman of the Board



Melanie Form
Member of the Board
Managing Director



Prof. Dr.-Ing. Manfred Aigner
President for Science and Research



Prof. Dr. Jürgen Ringbeck
President for Industry and Aviation

Working Groups and Task Force

Resources and Technologies



Quality, Certification and Use

Sustainability



Task-Force Economy and Production

Our Statues



Working Groups and Task Force

Resources and Technology

Examine available feedstocks and production options for sustainable, renewable aviation fuels



Quality, Certification and Use

Practical use of sustainable, renewable aviation fuels and challenges of quality and certification

Sustainability

Considering all three pillars of sustainability – environment, social equity and economy – along the entire value chain



Task Force Economy and Production

Examination of economic aspects and potential production capacities of sustainable, regenerative aviation fuels

How does aireg work?

- **Network:** Our members cover the entire value chain for SAF. The office is happy to establish contacts for exchange purposes as needed.
- **airegNews:** Our weekly newsletter keeps our members up to date on everything related to SAF. Our SonderairegNews provides short-term information on current developments, such as draft legislation.
- **Events:** Biennial conference on SAF and participation in other high-profile industry gatherings (ILA, Aviation Evening, etc.)



✈✈✈✈ LET'S FLY SAF. NOW! ✈✈✈✈

Climate Protection Plan of International Aviation in the face of major growth

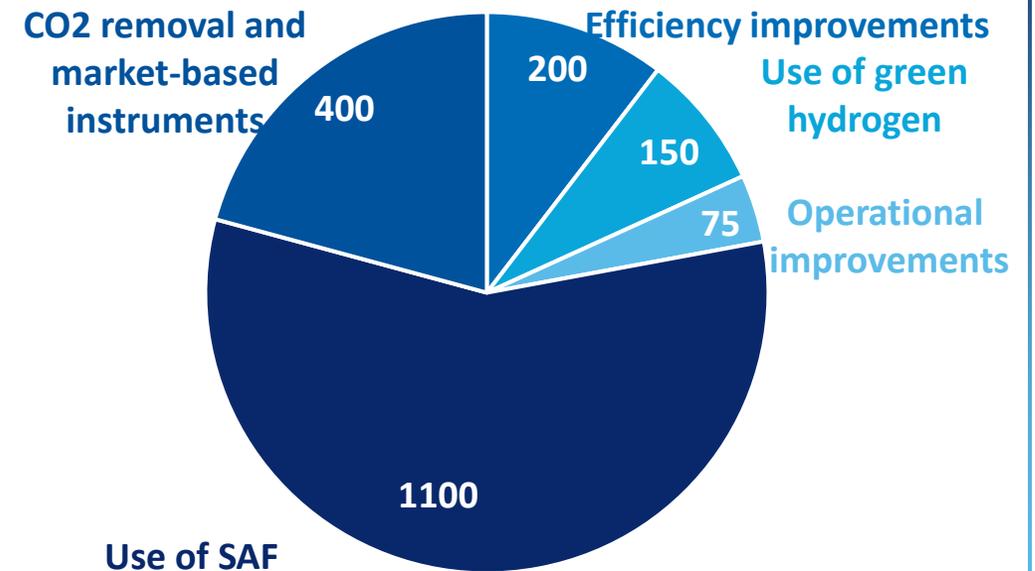
! Growth by 2050: ICAO expects revenue passenger kilometer (RPK) to double or even triple by 2050. !

→ At least doubling of the climate impact if no measures are taken.

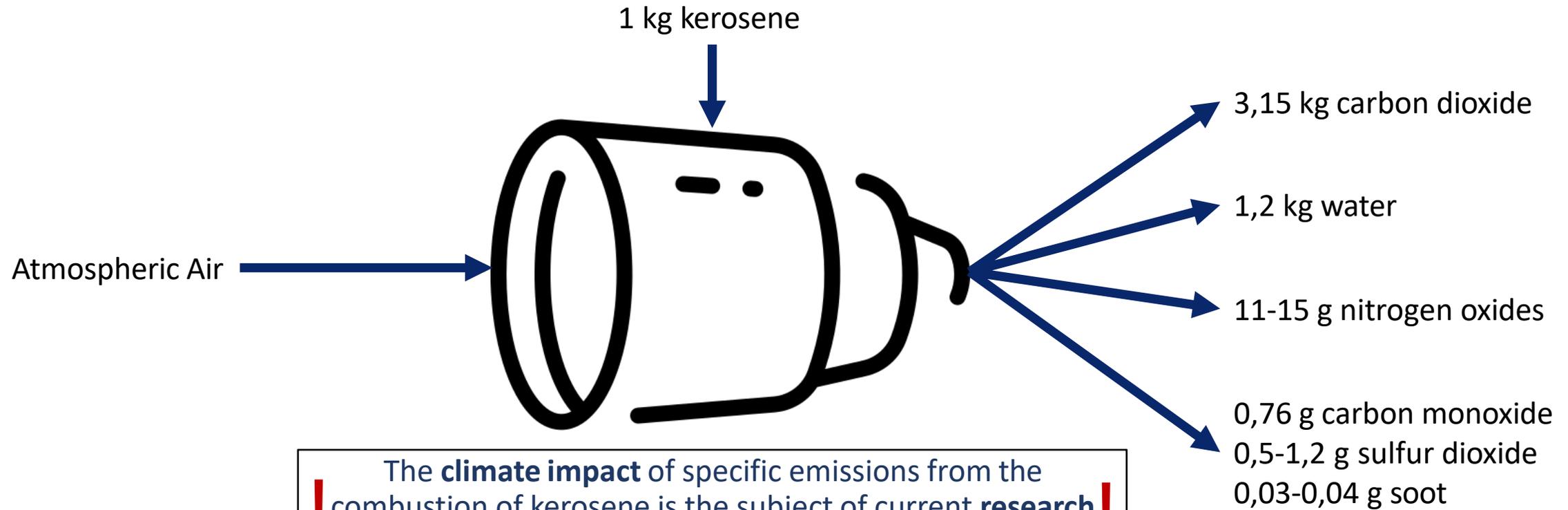
IATA has developed a net-zero scenario for global aviation in 2050. Renewable energies (SAF and green hydrogen) contribute 65% to the total reduction in emissions.

- **Use of SAF (57%):** IATA expects SAF to account for 80%–90% of fuel used by 2050.
- **CO2 removal and market-based instruments (21%):** DAC and offsetting create negative emissions.
- **Efficiency improvements (10%):** Modern aircraft and engines require less energy for their flights.
- **Use of green hydrogen (8%):** Green hydrogen is used on short- and medium-haul flights.
- **Operational improvements (4%):** Efficiency gains through investments in operations and infrastructure

IATA'S NET-ZERO SCENARIO FOR 2050

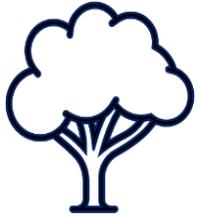


*Emissions reduction in megatons



The **climate impact** of specific emissions from the **combustion of kerosene** is the subject of current **research projects**, for example at the DLR.





Lower GHG emissions

- Already up to 80% less GHG emissions with HEFA-SAF compared to fossil kerosene
- With electricity-based SAF potentially up to 100% CO₂ emission reduction



Reduction of non-CO₂ effects

- Result from the formation of soot particles and other climate-impacting substances
- SAF burns cleaner with reduced formation of particles



Lack of Alternatives

- Other climate-friendly propulsion systems (electric/hydrogen) will be available from 2040 at the earliest
- Duration of market ramp-up very high due to long service life of aircraft



Drop-in solution

- No adaption of engines and tank infrastructure necessary
- Commercially available and in use today
- Already approved in admixtures up to 50%

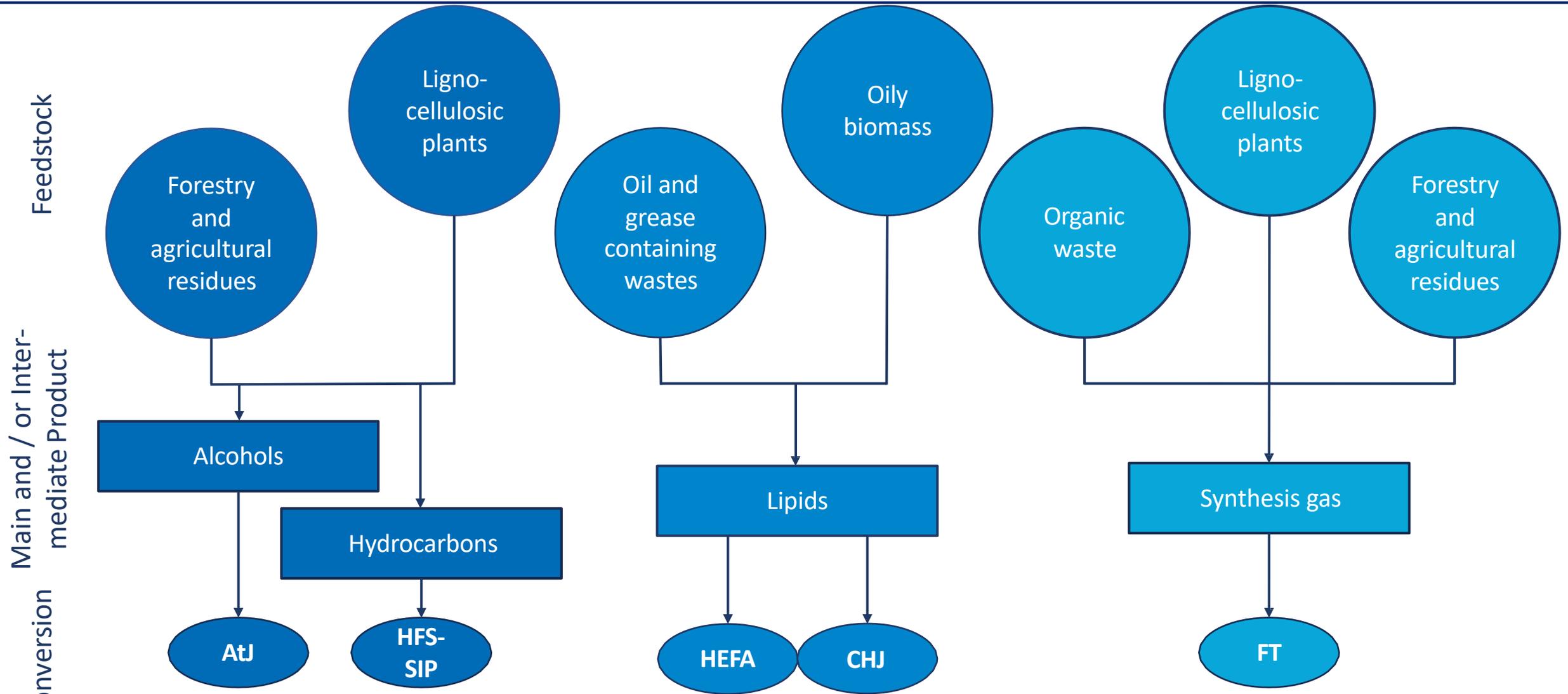
Overview of Approved SAF Options

ASTM	Annex	Year of Approval	Process	Blending Limit	Possible Feedstocks
D7566	1	2009	FT-SPK	50 Vol.-%	flexible (biogen, fossil, synthetic, e.g. PtL or BtL)
D7566	2	2011	HEFA-SPK	50 Vol.-%	fats/oils (e.g. plant-based oils, used cooking oils)
D7566	3	2014	HFS-SIP	10 Vol.-%	sugar, starch, lignocellulose
D7566	4	2015	FT-SPK/A	50 Vol.-%	flexible (biogen, fossil, synthetic, e.g. PtL or BtL)
D7566	5	2016	ATJ-SPK	50 Vol.-%	sugar, starch, lignocellulose
D7566	6	2020	CH-SK	50 Vol.-%	fats/oils (e.g. plant-based oils, used cooking oils)
D7566	7	2020	HC-HEFA-SPK	10 Vol.-%	fats/oils (algae oil)
D7566	8	2023	ATJ-SKA	50 Vol.-%	sugar, starch
D1655	1	2018	Co-Processing (HEFA-SPK)	30 Vol.-%	fats/oils (e.g. plant-based oils, used cooking oils)
D1655	1	2020	Co-Processing (FT-SPK, FT-SPK/A)	5 Vol.-%	FT-biocrude (primary feedstocks see FT-SPK, FT-SPK/A)
D1655	1	2023	Co-Processing (of HEFA)	24 Vol.-% (Feedstock) 10 Vol.-% (Product)	hydroprocessed biomass

ATJ-SPK (Alcohol to Jet Synthetic Paraffinic Kerosene), **ATJ-SKA** (Alcohol to Jet Synthetic Paraffinic Kerosene with Aromatics), **CH-SK** (Catalytic Hydrothermolysis Synthesized Kerosene), **FT** (Fischer-Tropsch), **HC** (Hydrocarbons), **HEFA** (Hydroprocessed Esters and Fatty Acids), **HFS-SIP** (Hydroprocessed Fermented Sugars to Synthetic Isoparaffins), **PtL** (Power-to-Liquid), **SPK** (Synthetic Paraffinic Kerosene), **SPK/A** (Synthetic Paraffinic Kerosene with Aromatics)

In addition to **biogenic SAF** and **electricity-based SAF**, there is the option of combining these pathways. These SAF are called **hybrid SAF**.

Biogenic SAF Production Pathways

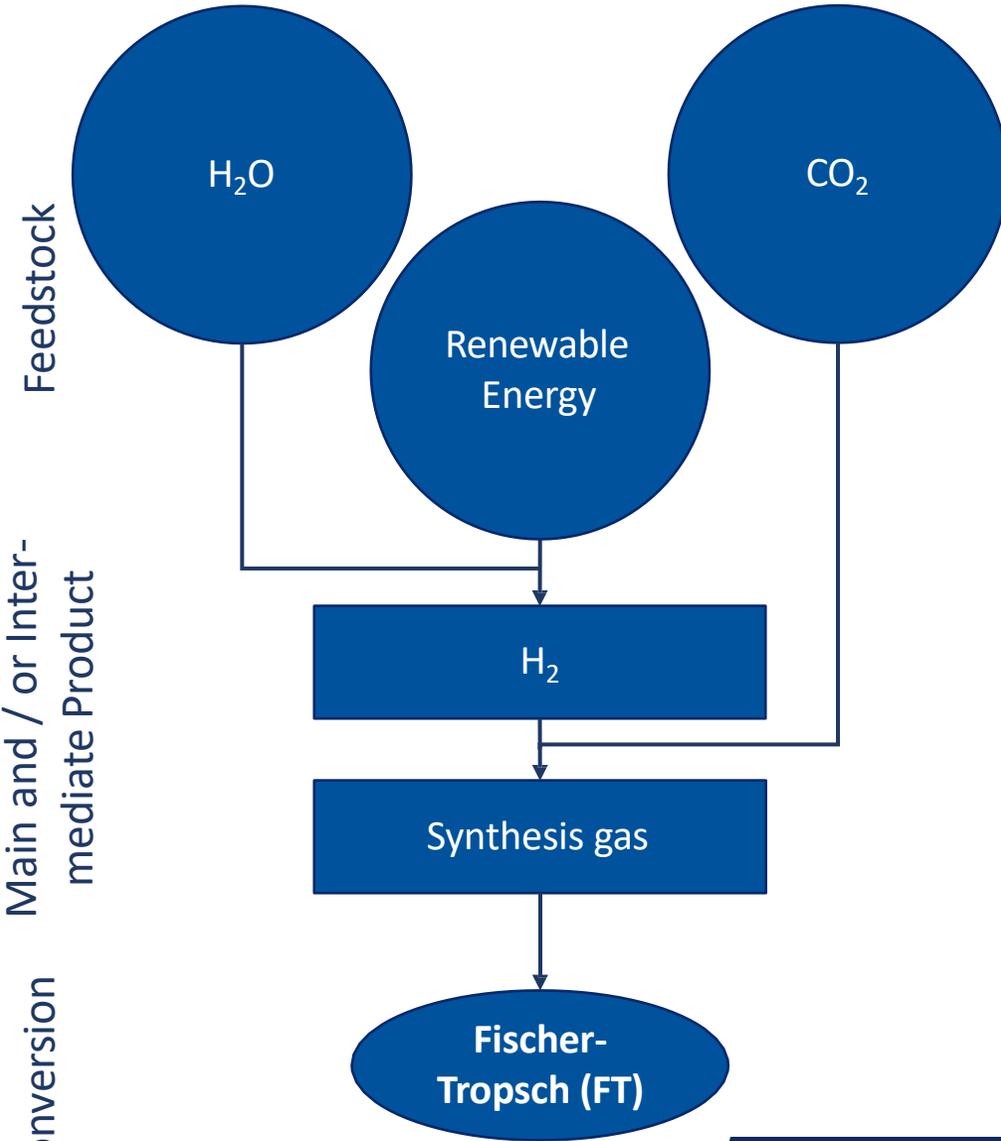


AtJ: Alcohol to Jet, **HFS-SIP:** Hydroprocessed Fermented Sugars to Synthetic Isoparaffins, **CHJ:** Catalytic Hydrothermolysis Jet, **HEFA:** Hydroprocessed Esters and Fatty Acids, **FT:** Fischer-Tropsch

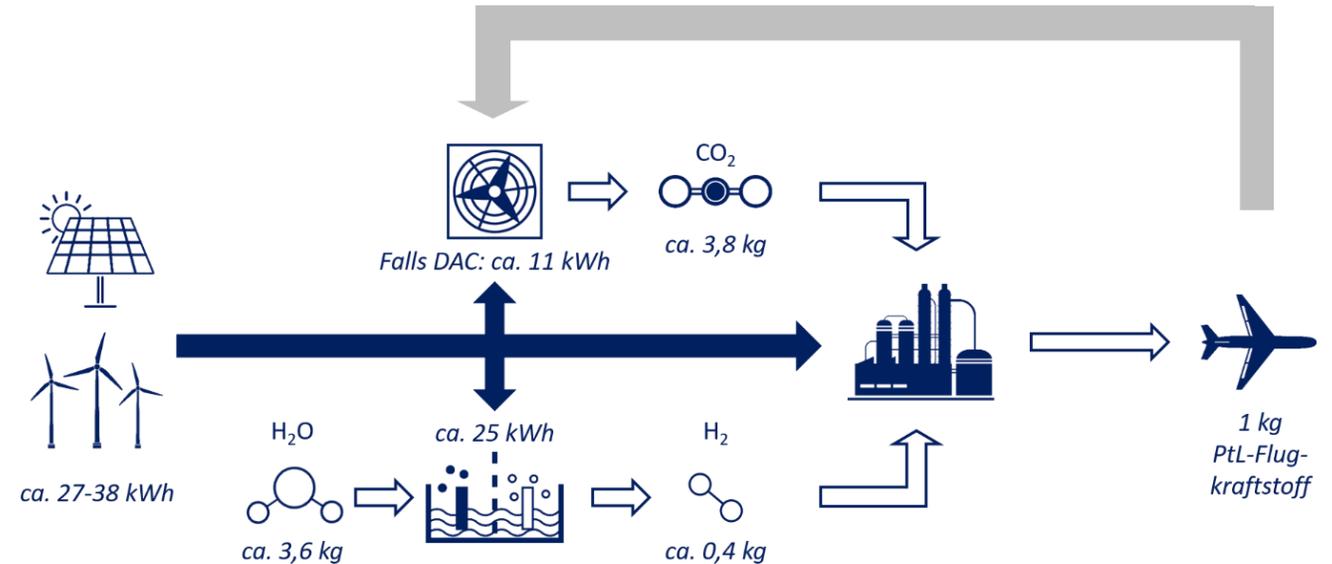
Source: Based on Thomson et al. 2020): Sustainable Aviation Fuels. The Best Solution to Large Sustainable Aircraft



Electricity-based SAF – Power to Liquid (PtL)



Quantitative overview of required feedstocks in the PtL production pathway:



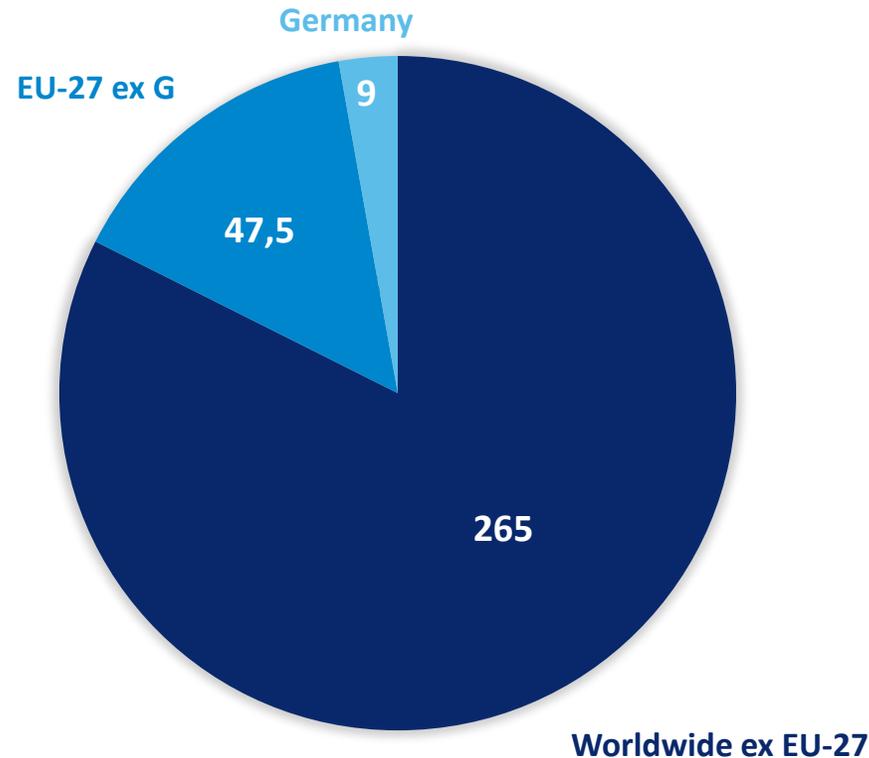
Feedstock required to operate all domestic German flights with PtL:

- Demand of about 700,000 tons of kerosene (comparison year 2019).
- At least 19,000 GWh of renewable energy -> 750 to 2,500 wind turbines
- 280,000 tons of hydrogen \cong 9 TWh hydrogen -> 10% of Germany's hydrogen demand in 2030 according to hydrogen strategy of the Federal Government of Germany
- 2.7 million tons of biogenic CO₂ -> potential of CO₂ capture of approx. 13 million tons from biogas, biomethane and bioethanol production in Germany

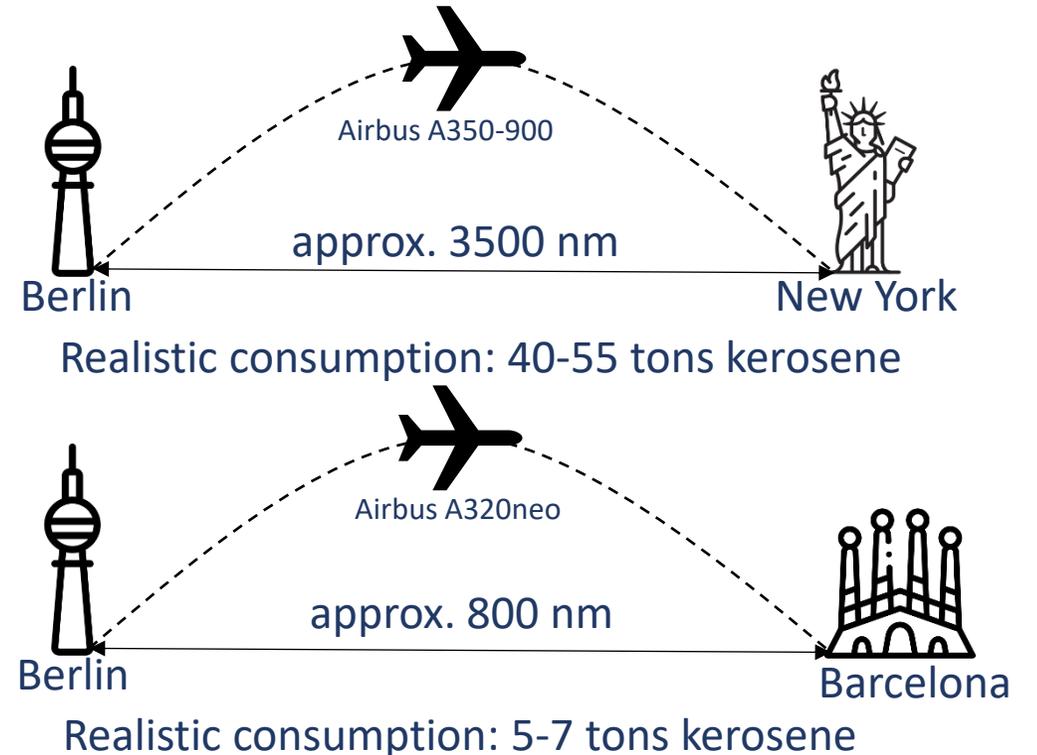
Source: aireg e.V. / TUHH (2023): PtL Factsheet



GLOBAL KEROSENE CONSUMPTION IN MILLIONS OF TONS IN 2024

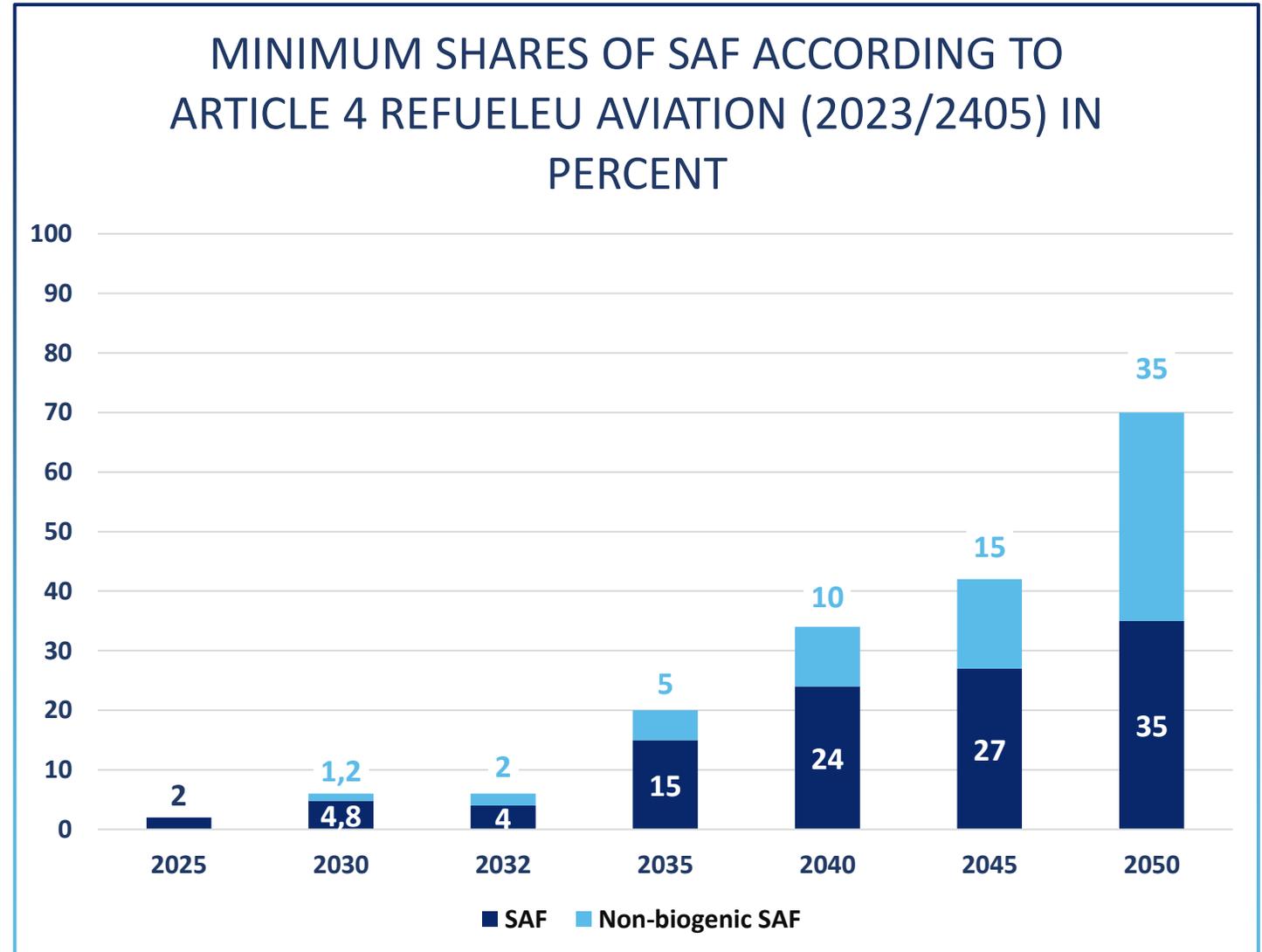


In 2024, German airlines achieved an average fuel consumption of 3.38 liters of kerosene per 100 passenger kilometers. To estimate the scale of individual flights, a number of realistic assumptions were made.

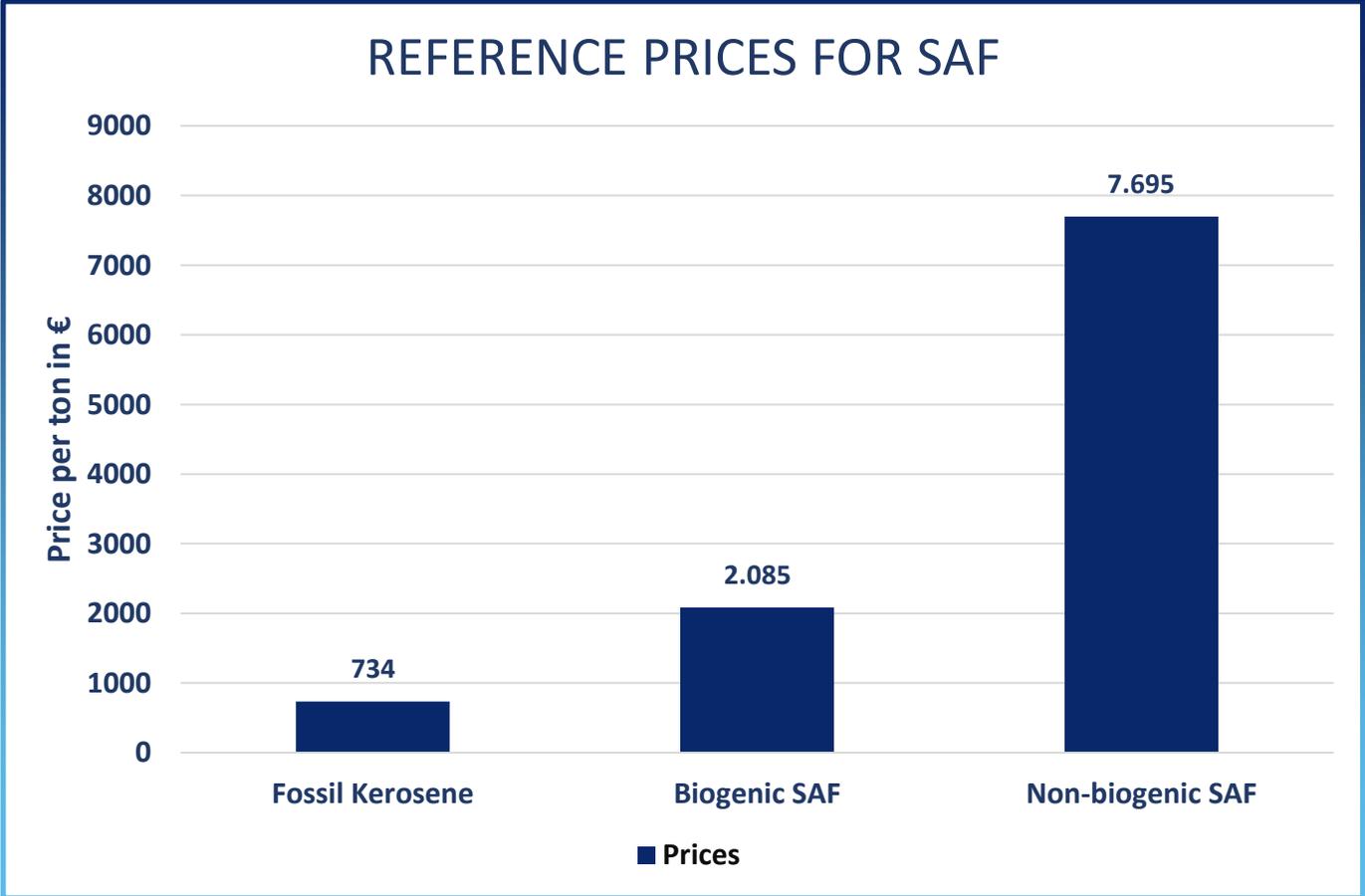


Sources: Statista - [Weltweiter Treibstoffverbrauch aller kommerziellen Fluggesellschaften von 2004 bis 2025](#)
 EC - [Supply and transformation of oil and petroleum products](#)
 BDL - [Kerosinverbrauch der deutschen Fluggesellschaften sinkt auf durchschnittlich 3,38 Liter pro Passagier und 100 Kilometer](#)

To stimulate the market ramp-up of SAF, the European Commission adopted the ReFuelEU Aviation regulation in 2023. Part of this initiative includes minimum quotas for distributors of aviation turbine fuel, which must be met from 2025 onwards. One percent corresponds to approximately 550,000 tons of aviation turbine fuel.



The reference prices (for SAF allowances/FEETS, among other things) are recorded annually in a report by EASA.

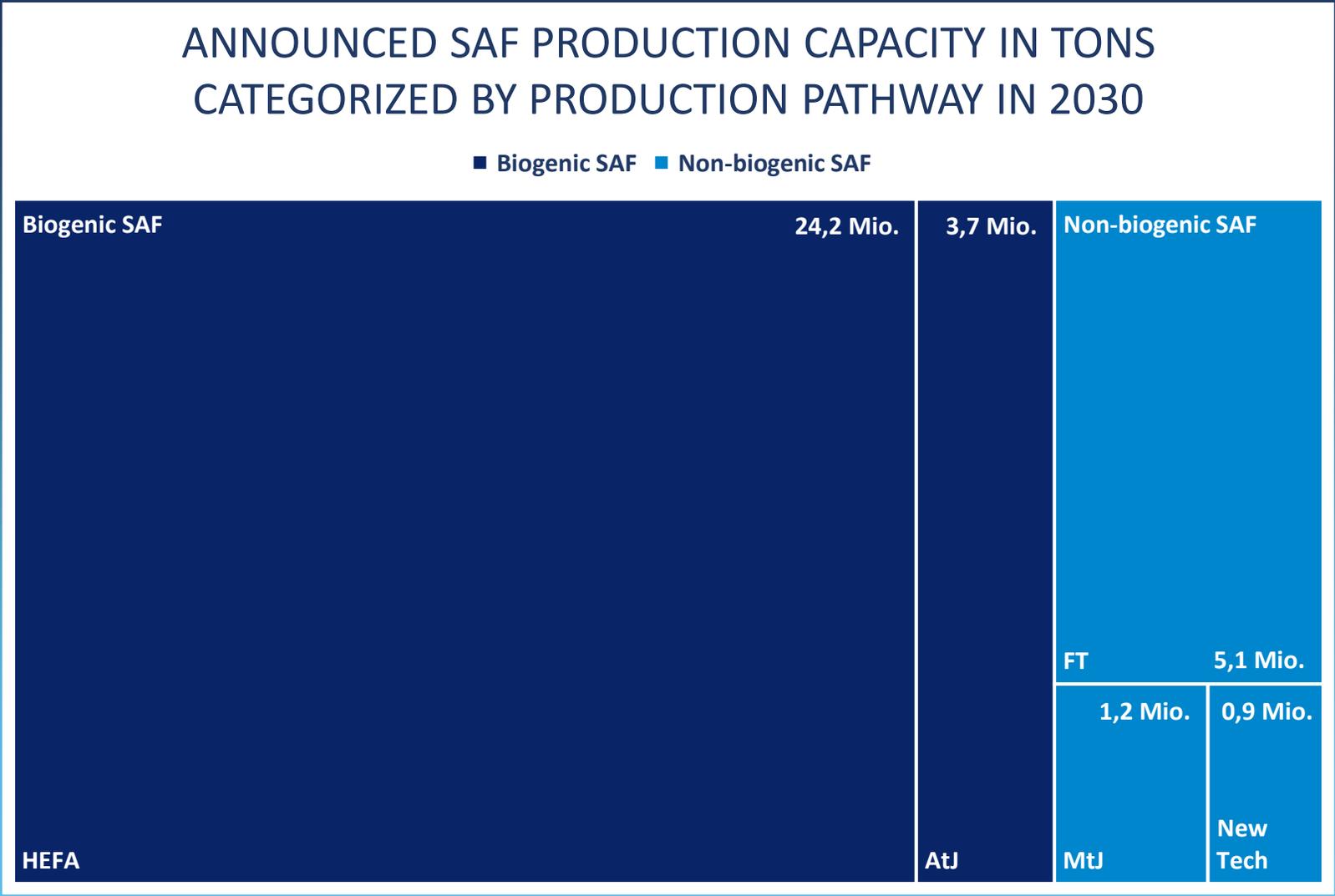


Source: EASA – [Aviation Fuels Reference Prices for ReFuelEU Aviation](#)

Announced SAF volumes in 2030



In its annually updated SAF Outlook, CENA Hessen examines the SAF production volumes announced worldwide, categorized here by production pathway.



Selection of commitments: Climate protection in aviation in various countries outside the EU



Aviation Initiative for Renewable Energy in Germany e.V.

Country	2025	2026	2027	2028	2030	2040	2050
	2 %	2 %	2 %	2 % 0,2 % PtL	10 % 0,2 % PtL	22 % 2,5 % PtL	22 % 2,5 % PtL
	0 %	0 %	0 %	0 %	5 %*	5 %*	5 %*
	0 %	0 %	0 %	0 %	10 %	10 %	10 %
	0 %	0 %	0 %	0 %	1 % ab 2031	1 %	1 %
	0 %	0 %	0 %	0 %	10 %	10 %	10 %
	0 %	1 %	1 %	1 %	3 - 5 %	3 - 5 %	3 - 5 %
	0 %	0 %	1 %	2 %	5 %	5 %	5 %
	0 %	0 %	1 %	1 %	3 - 5 %	7 - 10 %	7 - 10 %
	0 %	0 %	0 %	0 %	0 %	0 %	50 %
	0 %	0 %	0 %	0 %	5 %	5 %	5 %
	0 %	0 %	1 %	1 %	2,5 %	12,5 %	30 %
	0 %	0 %	0 %	0 %	0 %	0 %	47 %

✈✈✈✈ LET'S FLY SAF. NOW! ✈✈✈✈

Thank you for your attention!



Aviation Initiative for
Renewable Energy in Germany e.V.

Contact:

Melanie Form

Member of the Board
Managing Director

kontakt@aireg.de

aireg e.V. – Aviation Initiative for Renewable Energy in
Germany

Bundesratufer 10
10555 Berlin

www.aireg.de

Pictures:

© Airbus, A. Doumenjou & S. Ramadier



✈✈✈✈ **LET'S FLY SAF. NOW!** ✈✈✈✈