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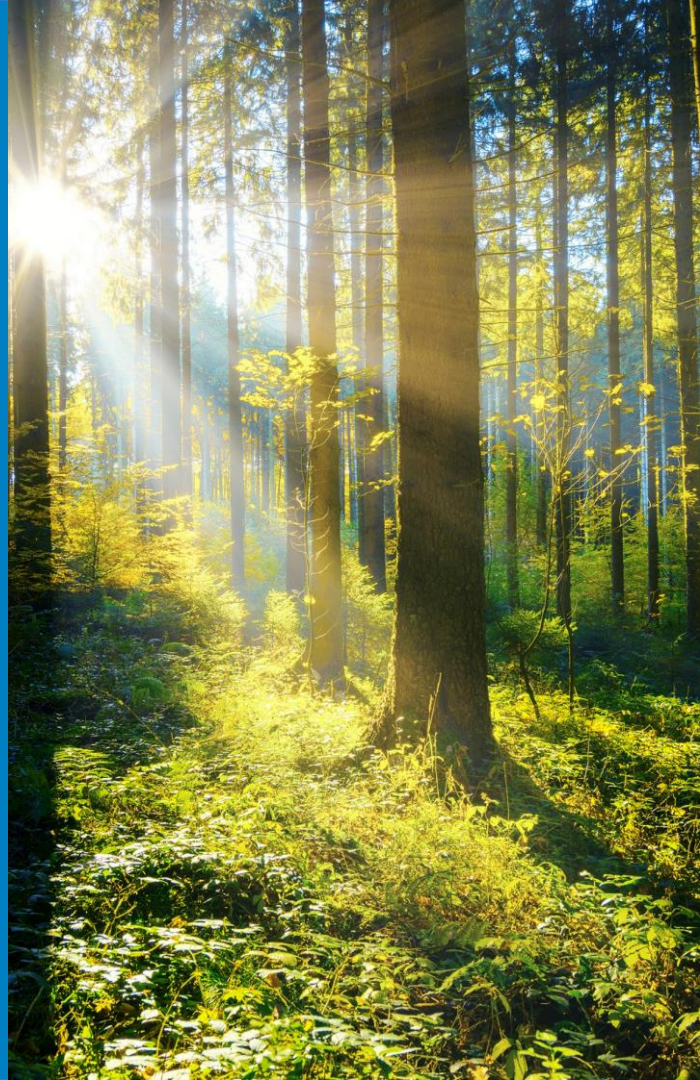
CAAF/3 outcomes and the expectations for States

AFCAC and EASA Joint Webinar Series on the acceleration of development, production & deployment of SAF in Africa

1st Webinar, 22 March 2024



Conference on Aviation Alternative Fuels (CAAF)

- Addressed the key issues of sustainability, feasibility, economics, production, and infrastructure, and endorsed the use of SAF for aviation.

- **Dissemination of the concept of drop-in fuels**, as an important means of reducing aviation greenhouse gas emissions without requesting the change of the aircraft or infrastructure.

- Established the ICAO Global Framework for Aviation Alternative Fuels

- recognized that the **sustainability of alternative aviation fuels is of essential importance** to the efforts to reduce CO2 emissions. This is ensured by application of sustainability criteria to SAF

- endorsed the 2050 ICAO Vision for Sustainable Aviation Fuels **as as a living inspirational path to significantly substitute conventional aviation fuels with SAF by 2050**

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CAAF/3

- Following adoption of the **Long Term Global Aspirational Goal (LTAG)** of net zero CO2 emissions by 2050 at the ICAO 41st Assembly (October 2022).

Objective:

- Review 2050 ICAO Vision on SAF
- Agreeing a “ICAO Global Framework for SAF, LCAF and other Aviation Cleaner Energies” – including a quantitative goal

CAAF/3 – Outcome

- Agreement on ICAO Global Framework for SAF, LCAF and other Aviation Cleaner Energies

4 Building Blocks

Policy & Planning

- Collective global aspirational Vision to reduce CO2 emissions by 5% in 2030
- Continually monitored and periodically reviewed
- Increase production of SAF, LCAF and other, relying on financing, technology transfer and capacity building

Regulatory Framework

- CORSIA as basis for eligibility
- Acccounting methodologies to promote transparency, accuracy, consistency, comparability and completeness.
- CAEP undertakes study on fuel accounting systems, incl. preliminary exploration of ‚book and claim' concept

Implementation Support

- Invitation to all stakeholders to deliver a robust and substantial capacity-building and implementation support programme
- Follow *No Country Left Behind* (NCLB) initiative

Financing

- Progress on A41-24, Paragraph 18 to improve access to low-cost financing and funding, and further de-risking of projects.
- Develop case study of successful projects
- Operationalize „ICAO Finvest Hub" initiative

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Introduction of SAF as the main lever for decarbonizing the aviation sector

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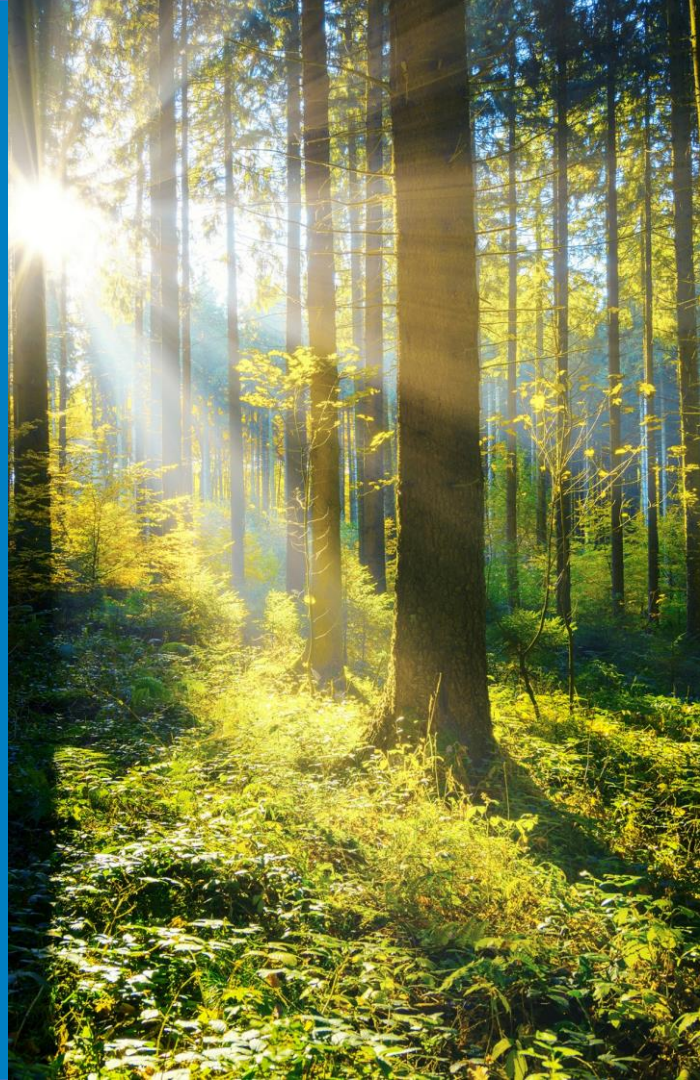
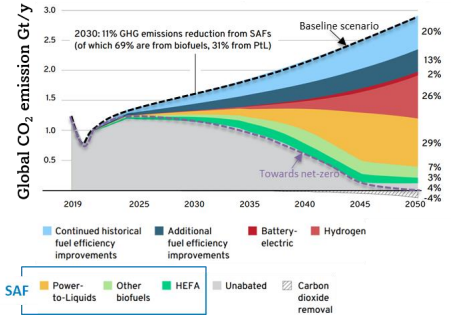


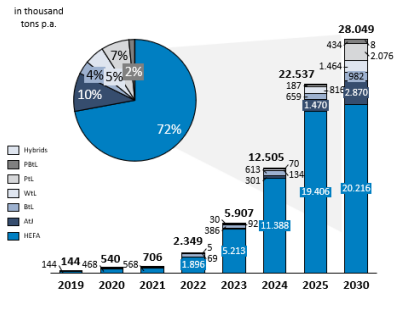
Guiding questions of our starting session



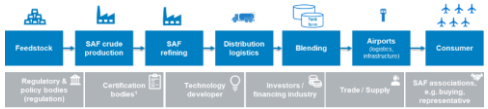
SAF as a viable way for the **airline industry** to **decarbonize**:

What are SAF?

General concepts and benefits



What are the current **market dynamics** for SAF worldwide and How does the future SAF supply scenario look like in 2030?

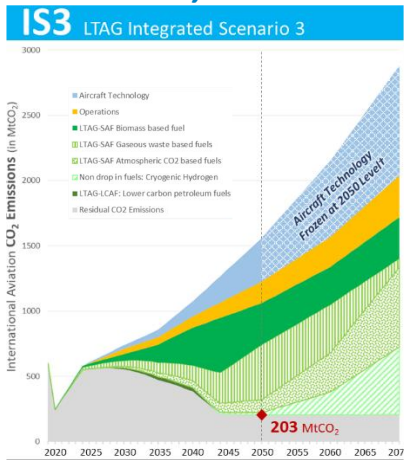


Which **stakeholders** could **contribute** to **"make it happen"** taking which **roles** to enable the **production** and **utilization** of **SAF**?

Source: CBR, 2023

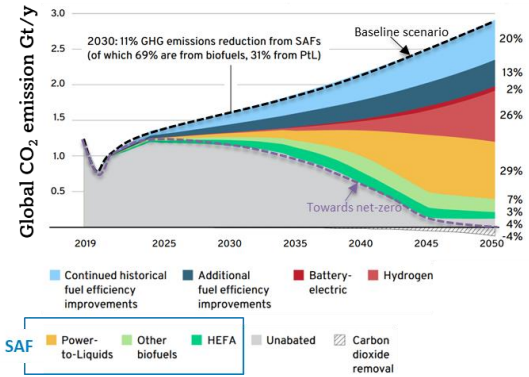
Independent of the various scenarios for emission reduction in the aviation sector, Sustainable Aviation Fuel will be the key contributor

LTAG, ICAO



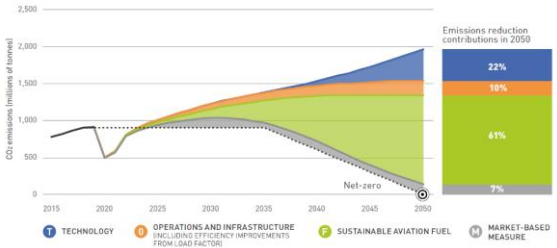
Until 2050 and beyond, **biomass, gaseous** and **atmospheric CO_2 based SAF** will play a **dominant role** in the **CO_2 emission reductions**.

MPP, WEF



Power-to-Liquid based SAF is foreseen as the **major contributor** to a **net-zero aviation sector** by **2050** followed by other biofuels and HEFA.

Waypoint 2050, ATAG

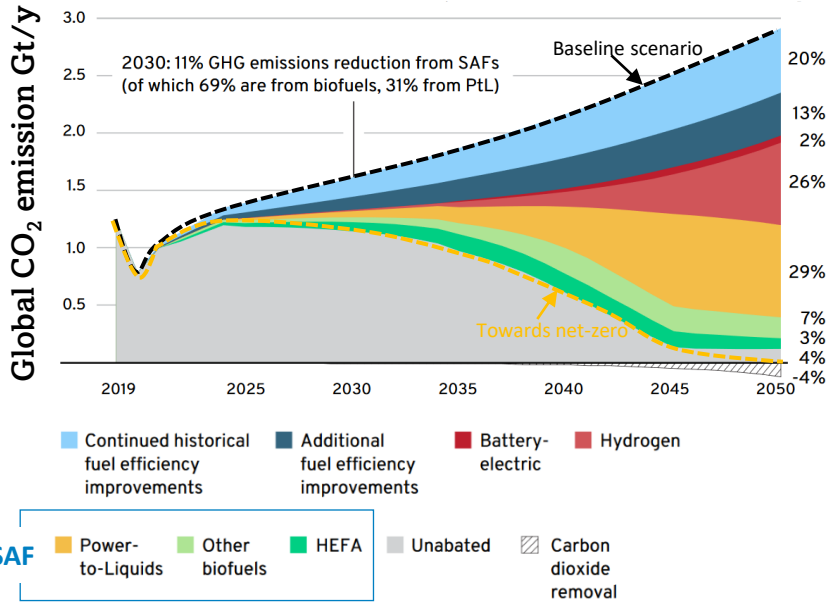


Pathway towards a **net-zero aviation sector** in **2050** mainly enabled by **SAF** with a **contribution** of **61%** with **ramp-up** beginning already in the **current decade**.

Source: Report on the feasibility of a long-term aspirational goal (LTAG) for international civil aviation CO_2 emission reductions/LTAG Integrated Scenario 3; ICAO, 2022; Mission Possible Partnership, Making net-zero aviation possible - An industry-backed, 1.5°C-aligned transition strategy, here the Optimistic Renewable Electricity scenario, WEF, 2022; Waypoint 2050 – An Air Transport Action Group project, ATAG, 2020; CBR, 2023; MPP: Mission Possible Partnership; WEF: World Economic Forum

Low-carbon substitutes for fossil jet kerosene, are critical to decarbonising aviation as hard-to-abate sector.

- **Global CO_2 emissions from aviation** exceeded **1 billion tons** in 2019, accounting for **>2%** of total anthropogenic CO_2 emissions.
- **SAF** is a **key contributor** to **reduce CO_2 emissions** in the decades to come **coexisting** with **more disruptive technologies**.



	GHG reduction	Regional flight	Short haul	Medium/ long haul
Batteries	100%	✓		
Hydrogen	100%	✓	✓	
Sustainable aviation fuel (SAF)	70-99%	✓	✓	✓

- Global jet-fuel demand in 2019: **~360 million tons**
- **Batteries and hydrogen are limited** to shorter flights
- **SAF** shows an intrinsic advantage by having similar properties to jet-fuel, offering a **drop-in compatibility** with the available fleet technology, and being suitable **for long-distance travel.**
- Different studies predict scenarios for 2050, where SAF global demand could be between **300-500 million tons**.

Source: Mission Possible Partnership, Making net-zero aviation possible - An industry-backed, 1.5°C-aligned transition strategy, here the Optimistic Renewable Electricity scenario, WEF, 2022; CBR, 2023

General concepts related to Sustainable Aviation Fuels

- Definition and main concepts

Sustainable Aviation Fuel (SAF) is a sustainable, non-conventional, alternative to fossil-based jet fuel. Several definitions and terminology may apply, depending on regulatory context, feedstock basis, and production technology.

EAER 2022

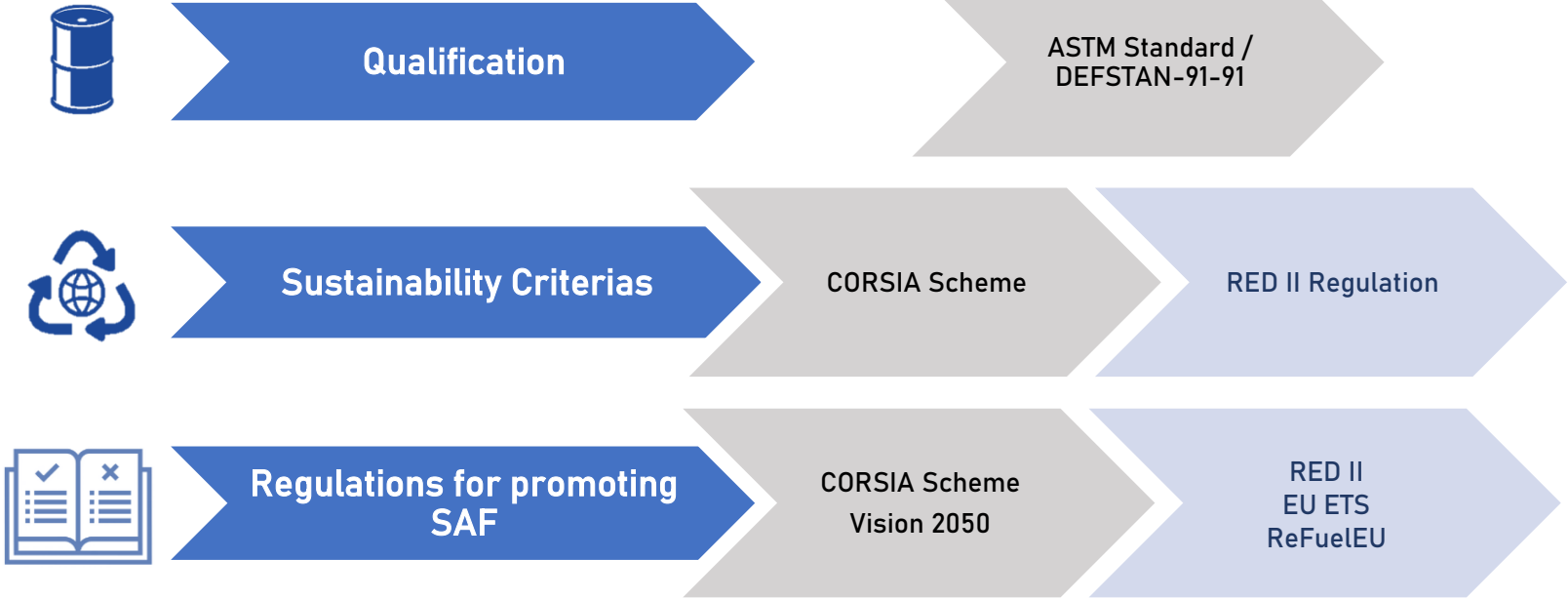
Conditions

Meet the technical standards that prove they have the same properties as the A-1 jet (ASTM D7566, ASTM 1655, DEFSTAN-91-91).

Meet certain sustainability criteria, which have been verified by an independent entity.

General concepts related to Sustainable Aviation Fuels

- Definition and main concepts



General concepts related to Sustainable Aviation Fuels

- SAF technical specifications

Qualification

All aviation fuel must meet strict technical specifications, with the ASTM standard being the most widely recognized, including for SAF.

EU, US, UK SAF Clearing Houses

Navigate producers through the fuel approval process

D7566

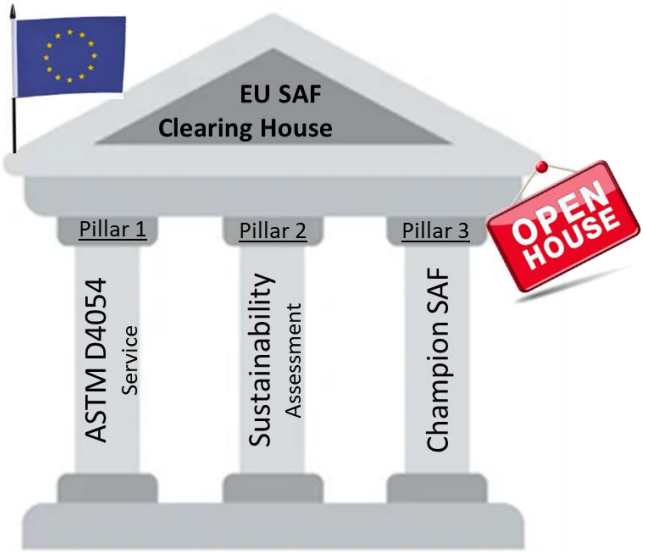
1. Annex A1: Fischer Tropsch (FT) Synthetic Paraffinic Kerosene (FT SPK), 2009.
2. Annex A2: Hydroprocessed Esters and Fatty Acids (HEFA SPK), 2011.
3. Annex A3: Hydroprocessed Fermented Sugar (HFS-SIP) 2014.
4. Annex A4: FT-SPK plus aromatics (FT-SPK/A), 2015.
5. Annex A5: Alcohol to Jet (ATJ-SPK), approved en 2016 para el empleo de isobutanol y actualizado en 2018 para etanol.
6. Annex A6: Catalytic Hydrothermolysis Synthesized Kerosene (CH-SK, or CHJ), 2020.
7. Annex A7: Hydro-processed Hydrocarbons, Esters and Fatty Acids Synthetic Paraffinic Kerosene (HHC-SPK or HC-HEFA-SPK), HEFA a partir de algas, 2020.
8. Annex A8: Alcohol-to-Jet Synthetic Kerosene with Aromatics (ATJ-SKA), 2023

D1655

1. D1655 Annex A1: Co-processing of biocrudes, fats and oils in a conventional refinery, 2018.
2. D1655 Annex A1: Co-processing of Fischer-Tropsch Biocrude, 2020.

In the annexes, blending requirements are established for each SAF pathway, currently the maximum allowed is a 50/50 blend (Annex A1, A2, A4, A5, A6, A8).

EU SAF Clearing House



Operational Concept

- The EU SAF Clearing House is a one-stop-shop operated as an “Open House”.
  - Coordinate existing actors in the EU.
  - Complement services.
  - Continuous improvement.
  - Efficiency & Impact are priority.

Pillar 1: ASTM D4054 Service (priority)

- Everything a fuel producer requires for efficient D4054 evaluation will be offered, including Prescreening, partial funding.
- Ensure integrity of data, offer staged expert recommendations to fuel producer.
- Improve & streamline D4054 process, with OEMs, US & UK CHs, EASA, FAA +.

Pillar 2: Sustainability Assessment

- $CO_{2(eq)}$ and resource intensity analysis, with coaching on alignment to EU & international regulatory environment & latest knowledge.

Pillar 3: Champion SAF

- Disseminate & explain challenges in SAF deployment.
- Advise on R&D questions, investment, policy coherence.

Managed by EASA through Contribution Agreement MOVE/EI/SUB/2022-519/SI2.877543

General concepts related to Sustainable Aviation Fuels

- Sustainability Criteria and regulation framework related to SAFs

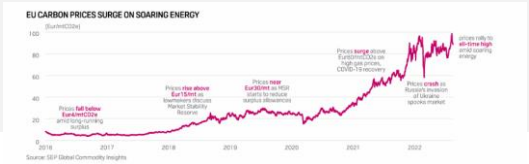
RED II Regulation

1. Establishes the **Sustainability Criterias for SAF** usage in Europe

2. Member States must require fuel suppliers to supply **at least 14% of the energy consumed in the transport sector by 2030** in the form of renewable energy

EU ETS

The usage of SAF reduces the ETS allowances that the aircraft operators need to report to their national authorities.



RefuelEU

Establish the framework for the implementation of an annual EU-wide SAF supply target:

2025	2%
2030	6% (1,2%)
2035	20% (5%)
2040	34% (10%)
2050	70% (35%)

General concepts related to Sustainable Aviation Fuels

- Sustainability Criteria and regulation framework related to SAFs

CORSIA

SAF Sustainability under CORSIA

The ICAO document "CORSIA Sustainability Criteria for CORSIA Eligible Fuels" set the requirements to the fuel and feedstock producers.

Emission GHG reductions

-10% GHG Emission reduction after Life Cycle Assessment

Land Use Change

not be made from land converted after 1 January 2008

The usage of SAF reduces the CORSIA Credits – Offset Credits - the aircraft operators need to report to their national authorities.

CORSIA Eligibility Framework and Requirements for Sustainability Certification Schemes	CORSIA Approved Sustainability Certification Schemes*	CORSIA Sustainability Criteria for CORSIA Eligible Fuels**	CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels***	CORSIA Methodology for Calculating Actual Life Cycle Emissions Values
Second Edition, June 2022	First Edition, November 2020	Third Edition, November 2022	Fourth Edition, June 2022	Third Edition, June 2022

Vision 2050

Political declaration to support the uptake of SAF in the ICAO member states (193 Countries).

→ In November, during the CAAF/3 meeting the SAF Vision 2050 declaration was updated

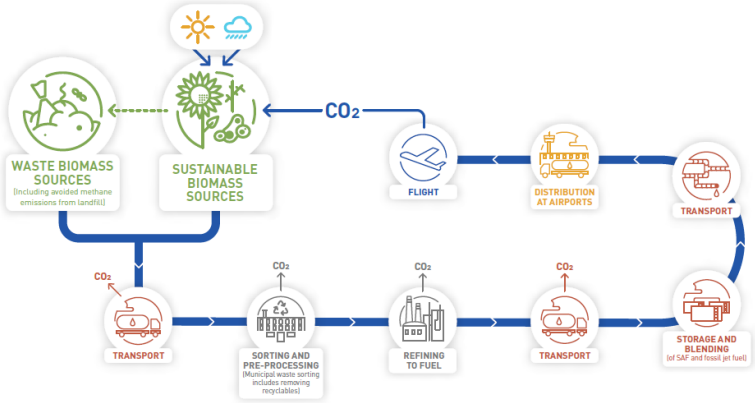
General concepts related to Sustainable Aviation Fuels

- Sustainability Criteria and regulation framework related to SAFs

CORSIA

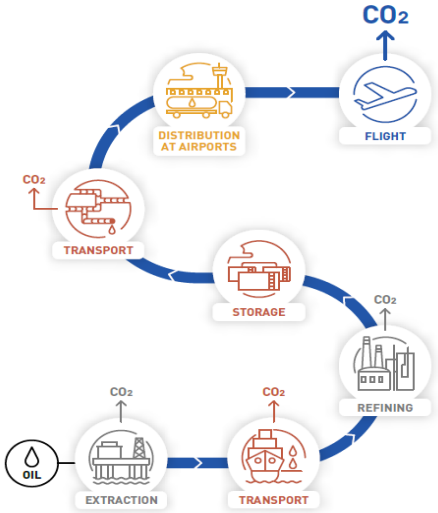
CORSIA sustainable aviation fuel

CORSIA sustainable aviation fuel. A renewable or waste-derived aviation fuel that meets the CORSIA Sustainability Criterias.



CORSIA lower carbon aviation fuel

CORSIA lower carbon aviation fuel. A fossil-based aviation fuel that meets the CORSIA Sustainability Criteria under Volume IV, Annex 16.



- Energy conservation measures (energy efficient design of plants, increased production efficiencies, improved efficiency monitoring)
- Process gas management (flaring management, venting control, fugitive emissions detection)
- Use of renewable/low carbon electricity, gas and hydrogen.
- Use of carbon capture and storage (CCS)

>10% reduction in lifecycle emissions compared to the aviation fuel baseline

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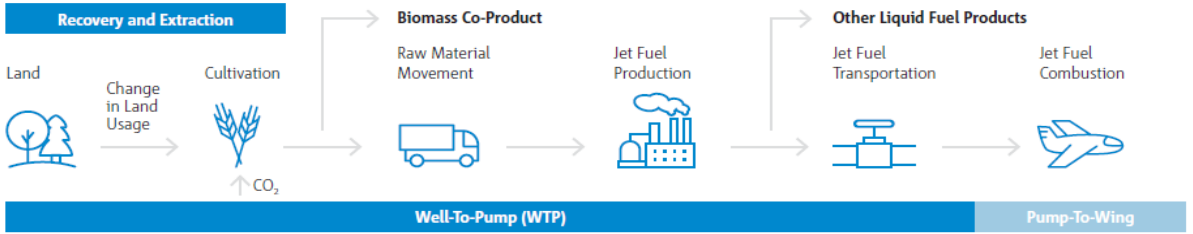
SAF Benefits

1. CO2eq emission reductions

Greenhouse gas emission reduction potential differs depending on the feedstock used, with values typically ranging from 65% to 85% reduction potential compared to conventional Jet A1.

In the most ambitious ICAO scenario for assessing CO2 emissions from international aviation, SAF could contribute to 63% of the emissions savings in 2050.

IS3, ICAO LTAG



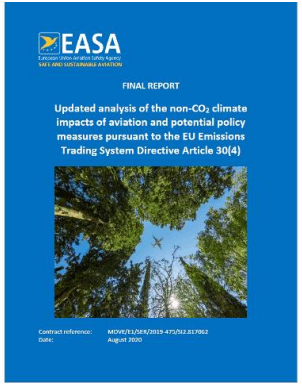
SAF Benefits

2. Non-CO2 emission climate effects mitigation

In 2018, the estimated Effective Radiative Forcing (ERF) from non-CO2 emissions accounted for more than half (66%) of the aviation net warming effect, although the level of uncertainty from the non- CO2 effects is 8 times larger than that of CO2.

Real test campaigns from DLR, Airbus and NASA showed that using a blend of half biofuel and half regular fuel reduced soot emissions by as much as 50%-70%.

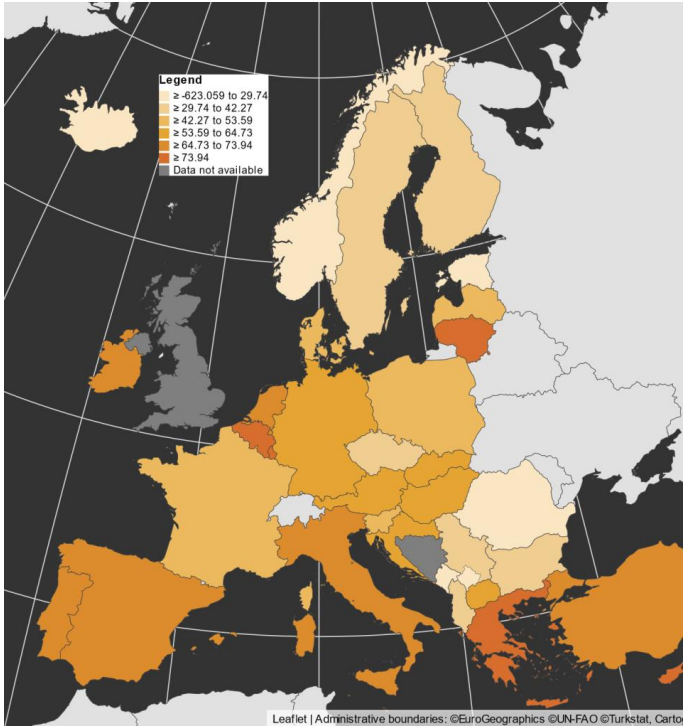
Nature article, 2021



Updated analysis of the non-CO2 effects of aviation

EASA, 2020

SAF Benefits



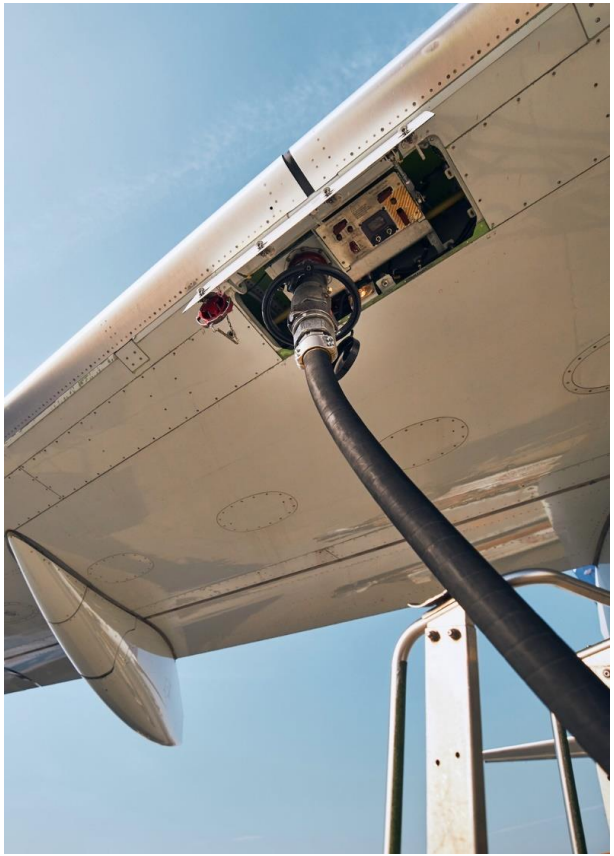
Energy import dependency in European countries in 2020 in percent of energy needs covered by net imports. Source: eurostat 2022.

3. Energetic independence

The EU **for example** produces large parts of its energy domestically, Still, most energy needs (about 60%) are met through imports.

The development of regional value chains of SAF can help to reduce the energy independence of the region, in a context of international instability and uncertainty. This will also improve the trade balance, reducing the need for petroleum-based products.

Conclusions and take aways



1. All aviation **fuels must meet strict specifications, with the ASTM standard being the most widely recognized**, including for SAF. Once certified as SAF, it can be used directly - in a blending percentage - in aircraft, and in an airport's hydrant network.

2. Greenhouse gas **emission reduction potential differs depending on the feedstock used**, with values typically ranging from 65% to 85% reduction potential compared to conventional Jet A1.

3. Achieving the GHG emission reduction targets proposed by the aviation industry and organizations such as the International Civil Aviation Organization (ICAO) will require **a significant increase in the production and consumption of sustainable aviation fuels**.

A long way towards net-zero aviation with SAF as major contributor between opportunities and challenges

- Awareness about the **importance** of **SAF** in the **net-zero target 2050** has increased in the last years.
- The production in **2019** was only **~24 million liters**, up to ~100 million liters in 2021 to **~300 million liters** in **2022**.
- Over **450,000 flights** had already used SAF and more than **50 airlines** have it **tested** in their **SAF supply chains**.
- However, **SAF production** in **2022** was only **0.1%-0.15%** of **total aviation fuel demand** and a **great commitment** is **needed** to reach **450 billion liters** in **2050**.
- Only **one single production technology cannot be the solution** to face the ambitious target, but a strategic combination of them should be adopted and SAF integrated in the supply chain.

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Source: CBR, 2023

The “financing challenge” of new SAF projects

The producer perspective

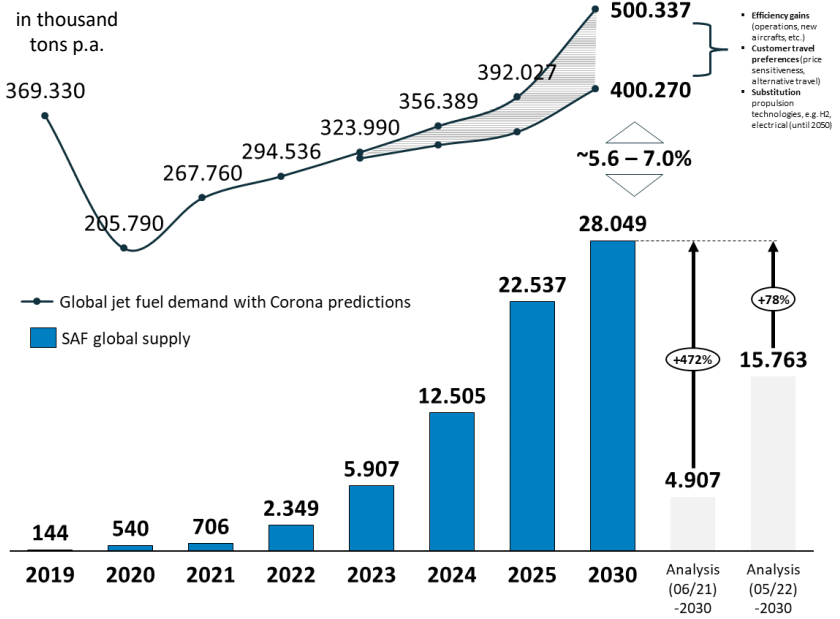
- **CAPEX investments** over a **trillion USD** to achieve **required SAF market volumes** of estimated **450 billion liters** in **2050**[1]
- **Technological**, **commercial** and **project implementation risks**, in particular first-of-its kind commercial plants
- **Securing projects’ bankability** with mid-to-long-term **offtake agreements**

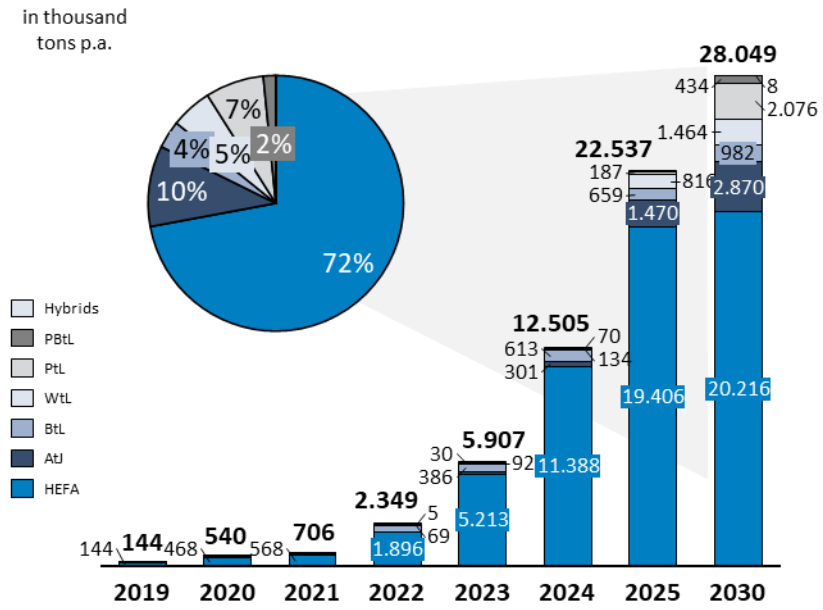
The airline industry perspective

- **Customer SAF awareness** and **willingness-to-pay** for sustainability
- **Financing** the **SAF premium** to fulfill sustainability goals, SAF mandates, etc. via increased ticket prices, etc.
- **“Balance sheet burden”** due to **offtake agreements beyond 10 years**, especially of new SAF conversion pathway projects

[1] i.e., 100 – 120 billion annually of capital investments (source: Bain & Company)

Global SAF supply only covers ~5.6% up to 7.0% of expected demand in 2030 with HEFA as predominant SAF pathway.



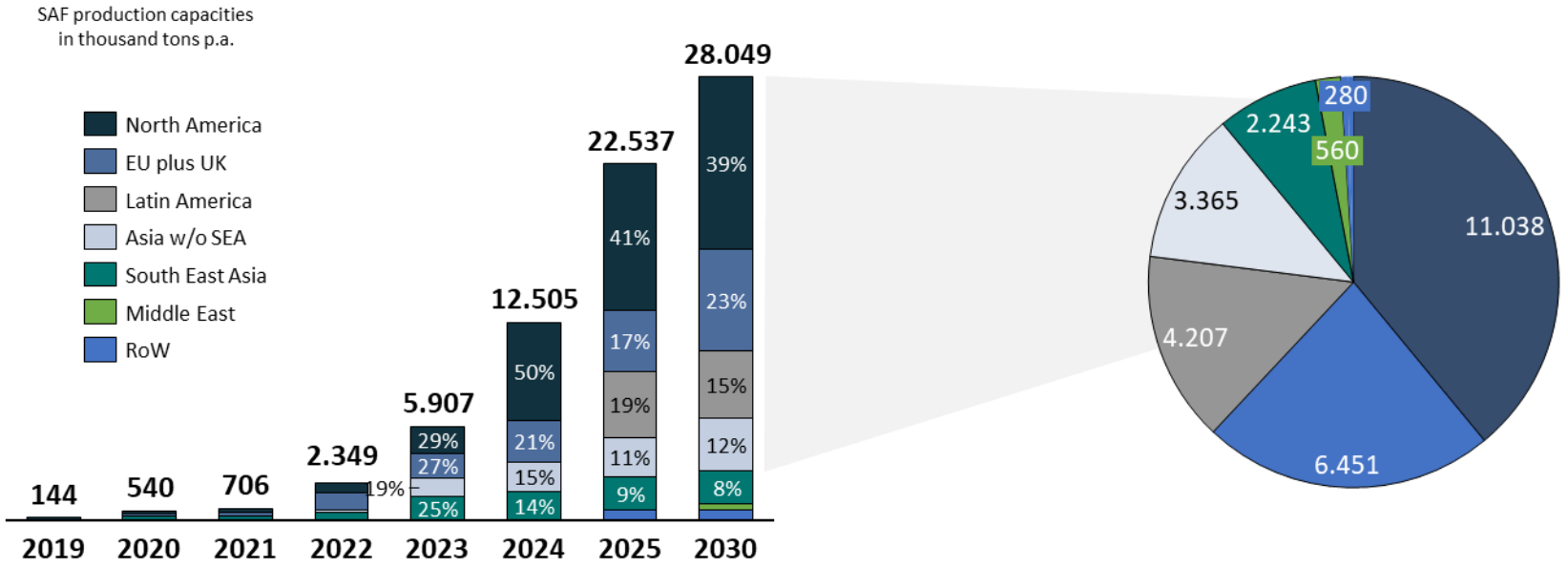


SAF production capacity only **covering ~5.6% up to 7.0% of global demand** in **2030** depending on consumption

HEFA is the recognized commercial pathway, as reflected in its **market share today** and in **2030.**

Source: BloombergNEF; Statista; Reuters/FGE ; Corporate announcements by respective companies, ; IEA; CBR, 2023 (06/2023);
Remarks: Predicted SAF production capacity based on operating plants and announced projects becoming operational until 2030.

Europe has played a frontrunner role in SAF production while North America (NA) takes the lead in terms of SAF production capacity.

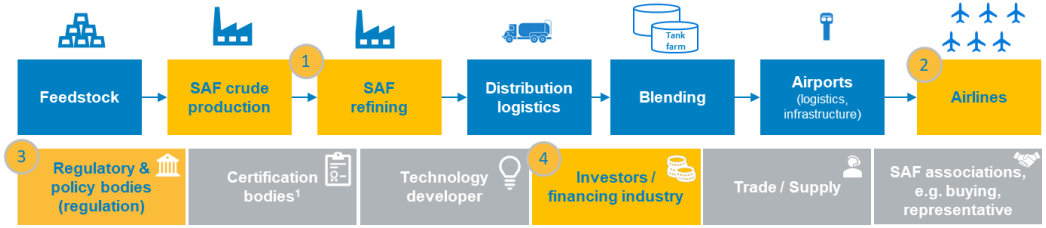


More than **60%** of **SAF production capacity** in **2030** is planned to be established in **North America** and **EU**.

All **figures** are subject to **constant review**, as new projects will be **announced** and some projects could have significant **delays** or **not materialize**.

Source: Corporate announcements by respective companies; CBR, 2023 (06/2023);
Remarks: Predicted SAF production capacity based on operating plants and announced projects becoming operational until 2030

SAF stakeholder landscape and their role in enabling the production and utilization of Sustainable Aviation Fuels



1

- Strong push from **O&G companies** required having control over production and logistics of fuels as SAF is a large-scale industry looking at the investment sizes (e.g., transforming refinery assets, new technologies)
- **Competition** on **feedstocks** (e.g., hydrogen, HVO) mitigated
- Current **start-ups** and **project developers** driven **SAF project landscape**

2

- **Price commitments** in **offtake agreements** pivotal for bankability
- **DEVEX support** for new projects
- Becoming **more involved** in the **provision of SAF**
- Creating **awareness** about **SAF** and satisfying **business travel demand**

3

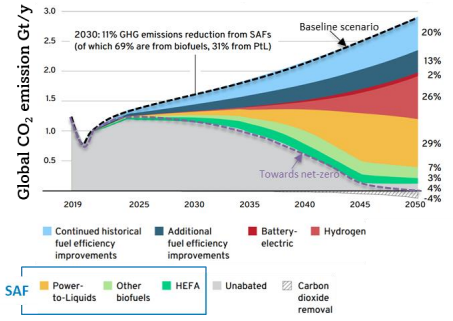
- **Government support** to scale SAF production rapidly to minimize the risks associated to SAF investments of utmost importance (e.g., Public Private Partnerships, guaranteed pricing models, tax credits, funding schemes)
- **Policies** must be **transparent, reliable, stable** and create a **level playing field** (e.g., anti-tinkering)

4

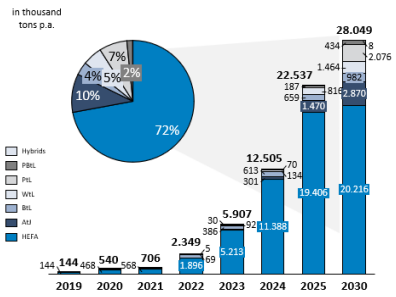
- Provision of **project financing** under increased level of exposure to **technological, implementation** and **commercials risks**
- Increased involvement of **development banks** and **non-refundable loans,** accessible **funds**, etc. by **non-private financing institutions**

O&G = Oil and Gas DEVEX = Development Expenditures

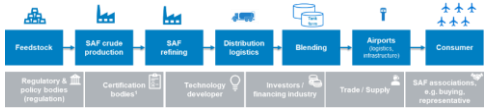
Key take-aways



Achieving **net-zero emissions** by **2050** depends on the **pace of scaling up** and **deploying SAF** in the aviation sector.



As of today, **global SAF capacity** only covers **~5.6-7.0%** of demand in 2030, with **HEFA** as main supply, thus accelerated **SAF technology adoption** and **project development** is needed.



SAF is a **multiple stakeholder approach** along the **SAF value chain**, starting from **Direct Supply Lines** to the **development** of a **new industry**.

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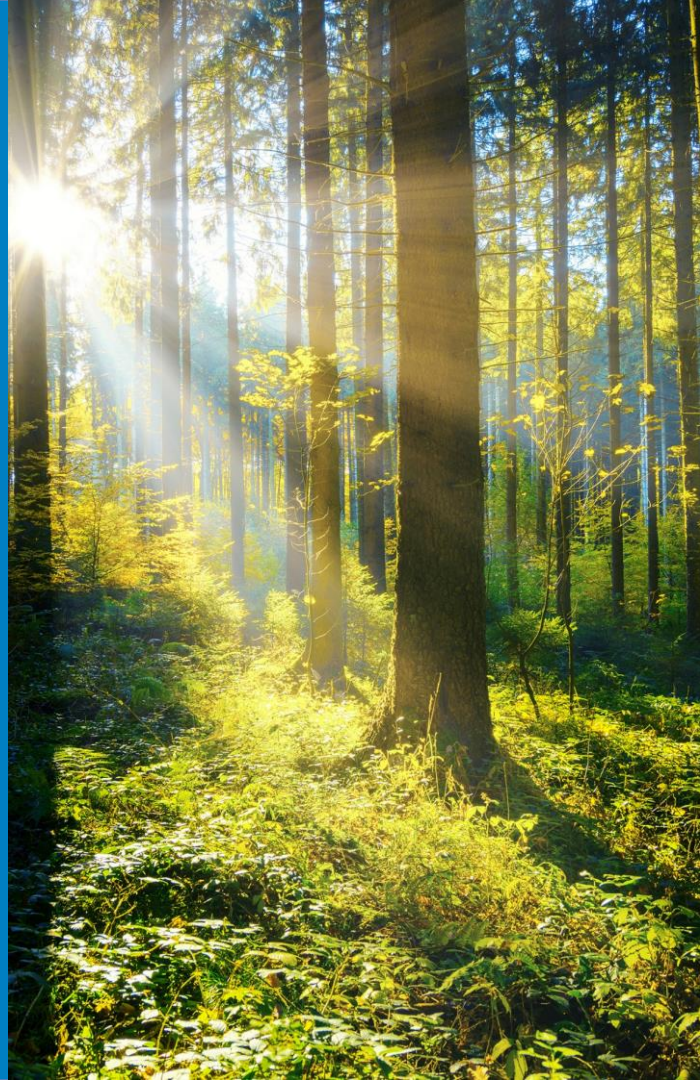
Session 3 –

Webinar Series: Overview on potential SAF webinar topics and poll

AFCAC and EASA Joint Webinar Series on the acceleration of development, production & deployment of SAF in Africa

1st Webinar, 22 March 2024



Selected webinars for the vote to best serve your interests and requirements

1. Sustainable Aviation Fuels 2030 – Market Outlook on Demand & Supply

- Global SAF supply and demand
- SAF pathways and certification (ASTM)
- Major feedstocks and players in the market

2. CORSIA Eligible Feedstocks

- CORSIA eligible feedstock categories (CEF)
- Process to include new types of feedstocks CORSIA CO2 offsetting requirements.

3. SAF Feedstocks and Regulation

- Feedstock types, regulatory recognition, market dynamics and outlook on trends
- Feedstocks driven by SAF demand and supply and available SAF technologies

4. Building a Viable Business Case (Plan) for Investability of SAF Projects

- Do's & Don'ts when building a SAF business case
- Success factors and major drivers of SAF return
- Investor types and techno-economic lessons learned

5. Sustainability Certification of SAF (ISCC, RSB)

- Introduction to sustainability certification schemes Status of deployment of certification schemes
- Process and provision of accreditation services

6. Sustainable Aviation Fuel – The Producer's Perspective

- Global SAF production roll-out
- First-hand experiences from SAF producer and from SAF technology and project developer

7. Role of Hydrogen in Decarbonizing Aviation

- Status of the Hydrogen and PtL development
- Regulatory environment and its impacts
- Role of hydrogen in aviation and decarbonization

8. Partnerships Along the SAF Value Chain

- SAF value chain and variety of stakeholders
- Partnership role models and industry examples
- Stakeholder mapping and national eco-system

9. Financing SAF Production

- Financing basics for SAF projects and structures
- Various types of financial sources and players
- Financing and support programs for SAF production

10. Book & Claim

- Basic idea of book & claim
- Status of regulatory adoption
- Outlook on market effects and opportunities

11. SAF Roadmaps, Policies and Regulation (ICAO, CORSIA, US IRA etc.)

- Idea, structure and requirements for a national SAF roadmap as basis for policy development
- Existing policy frameworks and regulation (types)

12. SAF Engagement by Airlines

- Options for airlines approach SAF
- Leading examples of airlines' engagements (from SAF strategies to offtake agreements to investment)

EASA
European Union Aviation Safety Agency

Thank you for your attention

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Your safety is our mission.

An Agency of the European Union