

Sustainable Aviation Fuels for the Decarbonisation of the European Aviation Sector

ISCC Stakeholder Meeting
“Decarbonisation of
the Aviation Sector”

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What is a SAF?

Sustainable Aviation Fuels (SAF)

- ✓ Not every **alternative fuel** is sustainable:
 - Producing alternative jet fuel from coal or natural gas is possible at commercial scale, but such synthetic fuel can not be sustainable.
 - Use **biogenic feedstock** is not a guarantee of sustainability, as its production can generate other environmental and social impacts
- ✓ This why we talk about **Sustainable Aviation Fuel (SAF)**



**IATA Sustainable Aviation
Fuel Roadmap**

© 2015 International Air Transport Association.

What is a SAF?

Two crucial criteria:

- ***Suitable for commercial aviation, drop-in:***

- It can be used for commercial flights only if it complies with the current specifications for safety and quality:

- ASTM specification D1655 /D7566 (Jet A-1)
- DEF STAN 91-91 (Jet A-1)



- ***Sustainable:***

- comply with **sustainability criteria:**

- Renewable Energy Directive (EU-RED)
- Sustainability criteria CORSIA (OACI)
- Voluntary schemes: ISCC, RSB...



Quality specifications: ASTM D7566



"Aviation turbine fuel manufactured, certified, and released to all the requirements of Table 1 of this specification (D7566), meets the requirements of Specification D1655 and shall be regarded as Specification D1655 turbine fuel. Duplicate testing is not necessary; the same data may be used for both D7566 and D1655 compliance. Once the fuel is released to this specification (D7566) the unique requirements of this specification are no longer applicable: any recertification shall be done in accordance with Table 1 of Specification D1655"

Synthetic Paraffinic Kerosine (SPK)
blending component, as described
in **ASTM D7566**
Annex A1 (FT SPK),
Annex A2 (HEFA SPK),
or Annex A3 (SIP) ... A7

**Aviation Turbine Fuel
(Jet A1)**
Compliant with **ASTM D1655**
or **DEFSTAN 9191**

Certificate of Quality: compliance
with the relevant Annex of D7566

Certificate of Quality:
compliance with the D1655 or
DS9191

BLEND
**Aviation Turbine Fuel Containing
Synthesized Hydrocarbons**
compliant **ASTM D7566**
=
compliant with **ASTM D1655**
Aviation Turbine Fuel (Jet A1)

Certificate of Quality: compliance with

D7566,
Specification for
Aviation Turbine
Fuel Containing
Synthesized
Hydrocarbons

D1655,
Specification for
Aviation Turbine
Fuels

Allowing that syn.
fuels blends
complying w. **D7566**
can be used in the
conventional
fuelling
infrastructures and
aircrafts as jetA1
D1655.

Sustainability

- ✓ There are different frameworks for verify the **sustainability**, often described within three levels: **Principles, criteria & indicators**

- ✓ **International standards, i.e.:**

ISO 13065

Principle - aspirational goal that governs decisions or behavior

Criterion - requirement that describes what is to be assessed.

Note 1: A criterion adds meaning and operability to a principle without itself being a direct measure of performance.

Note 2: A criterion is characterized by a set of related indicators.

Indicator - quantitative, qualitative or binary variable that can be measured or described, in response to a defined criterion.

- ✓ **Regulatory:**

- **RED** (EU)
- **CORSIA** (OACI)



ICAO

- ✓ **Voluntary:**

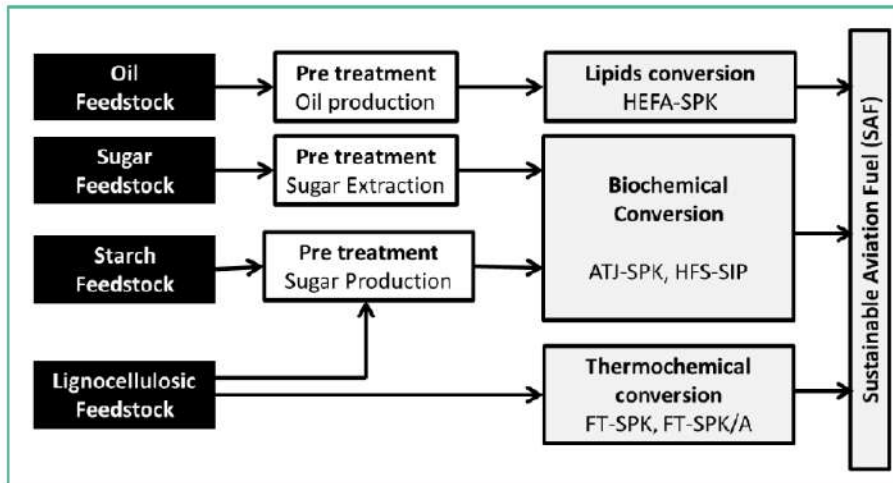
- **Voluntary schemes:** ISCC, RSB...



RSB
Roundtable on Sustainable Biomaterials
www.rsb.org

Technology: production pathways

- ✓ In just the latest 10 years, (8+) technology pathways approved covering a broad portfolio of different feedstocks



Fuente: [ICAO Sustainable Aviation Fuels Guide](#)

Technology: production pathways

→ D7566

- A1: Fischer Tropsch (FT) Synthetic Paraffinic Kerosene (FT SPK), since 2009

- A2: Hydro-processed Esters and Fatty Acids (HEFA SPK), since 2011

- A3: Hydro-processed Fermented Sugar (HFS-SIP) since 2014

- A4: SPK plus aromatics (FT-SPK/A), since 2015

- A5: Alcohol to Jet (ATJ-SPK), since 2016 for isobutanol, 2018 for ethanol

- A6: Catalytic Hydrothermolysis Synthesized Kerosene (CH-SK, or CHJ), since 2020

- A7: Hydro-processed Hydrocarbons, Esters and Fatty Acids Synthetic Paraffinic Kerosene (HHC-SPK or HC-HEFA-SPK), from algae oils, since 2020

Blend

50%

10%

50%

10%

→ D1655

- A1: Co-processing of biocrudes, fats and oils in a conventional refinery, since 2018, inc. FT syncrude since 2020.

BIO
Up to 5 % v.

Technology: production pathways

✓ And there will come more...

Current Fuels in the D4054 Qualification Process

The table below shows the pathways actively pursuing certification at various stages in the process.

ASTM Progress	Pathway	Feedstock	Task Force Lead
ASTM Balloting			
Phase 2 OEM Review			
Phase 2 Testing	Hydro-deoxygenation Synthetic Kerosene (HDO-SK)	Sugars and cellulotics	Virent (inactive)
	Hydro-deoxygenation Synthetic Aromatic Kerosene (HDO-SAK)	Sugars and cellulotics	Virent
Phase 1 OEM Review	High Freeze Point Hydroprocessed Esters and Fatty Acids Synthetic Kerosene (HFP HEFA-SK)	Renewable FOG	Boeing
	Integrated Hydrolysis and Hydroconversion (IH ²)	Lignocellulosics	Shell
Phase 1 Research Report			
Phase 1 Testing	Alcohol-to-Jet Synthetic Kerosene with Aromatics (ATJ-SKA)	Sugars and lignocellulosics	Swedish Biofuels, Byogy
	Alcohol-to-Jet (ATJ)	Sugars	Global Bioenergies

http: www.caafi.org

Policy



EUROPE: A moment for change

- ✓ During 2019 and 2020 we have observed a significant change in the european and national regulations and policies :
 - ✓ **Norway**, the first stablishing a mandate, starting from 0.5% in 2020.
 - ✓ Several MS such as **Denamark, France, Germany, the Netherlands, Spain** and **Sweden** are planing mandates for SAF or to adhere to a common EU SAF mandate .
- ✓ In this line, the EC has launched the regulatory initiative **ReFuelEU Aviation** aiming to impulse the SAF supply in the UE.

Law

Sustainable aviation fuels – ReFuelEU Aviation



The EU context

Towards ReFuel EU

The UK

The Renewable Transport Fuel Obligation (RTFO) rewards SAF production with the same economic incentives given to road vehicles.

The Netherlands

SAF Roadmap under development with a blending mandate at the national -or EU- level. Focus on advanced feedstocks. First SAF plant (SkyNRG) in 2022

Germany

National legislation for GHG-reduction of fuels (to transpose the RED II) and the German National Hydrogen Strategy foresee a SAF energetic sub-quota of 2 % in 2030 and ONLY for PtL-kerosene.

France

SAF roadmap to reach a SAF supply of 2% in 2025 and 5% in 2030. Focus on advanced feedstocks

Spain

Climate Change Law: SAF supply objective in 2025. Several new bio-refineries under planning with special focus on wastes and residues.

Portugal

Roadmap for Carbon Neutrality (RNC2050): integrated approach to transport decarbonisation including aviation

Norway

SAF blend 0,5% mandate started in 2020. Considering a 30% target for 2030.

Denmark

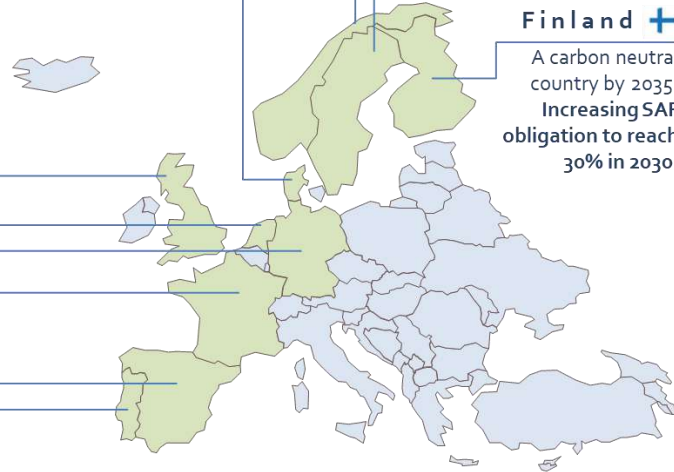
SAF blend obligation under study.

Sweden

A carbon neutral country by 2045. Legislative proposal for SAF blend ratios from 1% in 2021 to 30% in 2030. Fossil free Sweden industry initiative.

Finland

A carbon neutral country by 2035: Increasing SAF obligation to reach 30% in 2030.



Source: SENASA

Key projects to be followed

- ✓ R&D pioneer projects for SAF deployment in the EU



2016-2020

A new impulse to the
European Advanced Biofuels Flightpath Initiative



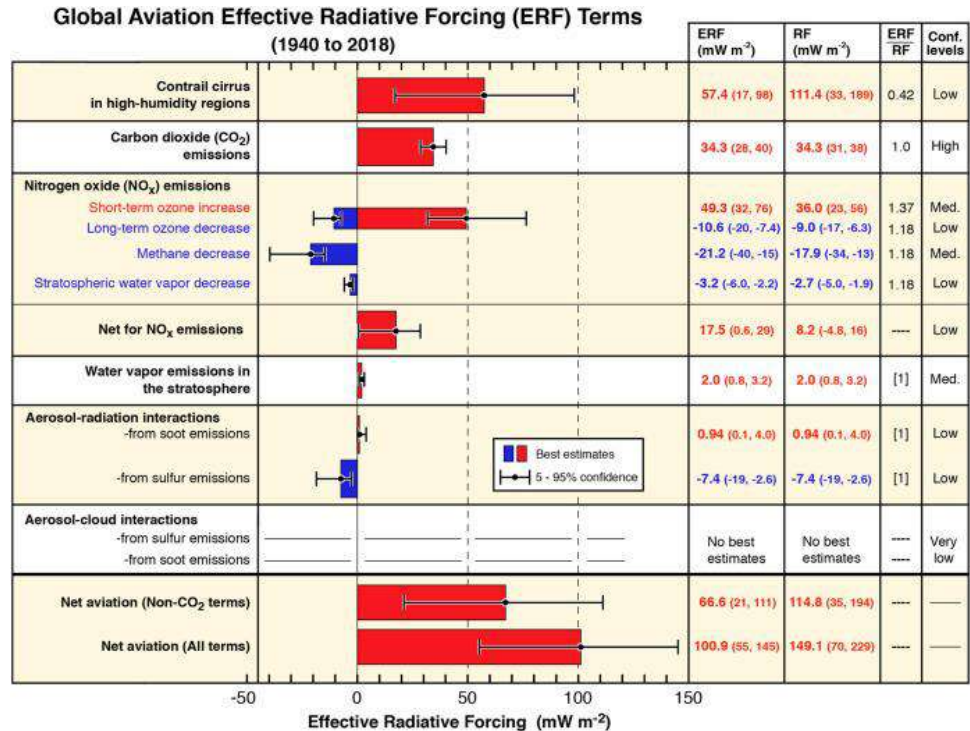
Key projects to be followed

- JETSCREEN
- BIO4A
- FlexJET
- REWOFUEL
- KEROGREEN
- Hyflexfuel
- Sun2Liquid
- AVIATOR



Next items...

- ✓ Non-CO2 effects
- ✓ Recycled carbon





SENASA