CAAFI's SAF Mini Symposium

Non-US initiatives

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Virtual: 1st June 2021

IATA

Global SAF Facts in 2021

360,000 flights

2016: 500 flight

2025: 1 million flights

100+ million litres per annum

2016: 8 million litres

2025: around 5 billion litres

36 Countries with SAF policy

2016: 2 countries

2025: potentially a global agreement

7 technical pathways

2016: 4 technical pathways

2025: 11 technical pathways

60% - 100% CO_2 reduction

2016: approx 60% reduction

2025: approx. 80% reduction

$7 billion in forward purchase agreements

2016: $2.5 billion

2025: > $30 billion

2025 figures are IATA Environment estimates

Global roadmaps: an international proliferation

Subtle differences… similar themes

	Geographical scope	Major goals	Key underlying elements
Waypoint 2050 *ATAG*	Global	▪ -50% CO2 by 2050 ▪ Net-zero possible globally by 2060/65	
Destination 2050 *A4E, ACI Europe, CANSO Europe, ASD Europe, ERA*	Europe Intra-EEA + departing flights	▪ Net-zero 2050 ▪ -55% below 1990 CO2	Heavy reliance on hydrogen for intra-EEA flights by 2050
Sustainable Aviation *British Airways, easyJet, Airbus, NATS, plus others*	United Kingdom Domestic + departing flights	▪ Net-zero 2050	Comparatively small use of SAF and high use of MBMs to meet net-zero. Being re-examined post-Covid
Norway roadmap *Avinor, SAS, Norwegian, Widerøe, NHO Luftfart, LO*	Norway Domestic + departing flights	▪ Fossil free by 2050	Norway has a 0.5% SAF blend mandate from 2020, expected to reach 30% by 2030.
Fossil Free Sweden: Aviation *Svenskt Flyg (Swedish ATAG)*	Sweden Domestic + departing flights	▪ Fossil free domestic by 2030 ▪ Fossil free for all departing flights by 2045	Sweden SAF blending mandate approx. 1% blend will be needed from 2021, rising to 30% by 2030 (for all departing flights from Sweden)
Smart and Sustainable *KLM, Schiphol, Tui, easyJet, Transavia, LVNL, SkyNRG and others*	Netherlands Departing flights	▪ 35% reduction in CO2 by 2030	Also a Dutch Govt aviation roadmap released in 2020: -50% CO2 by 2050, Net-zero by 2070
Denmark roadmap	Denmark Domestic + departing flights	▪ Dom: -70% CO2 by 2030 (vs 1990) ▪ Int: -30% CO2 by 2030 (vs 2017)	Desire to introduce SAF blending mandate similar to Norway. Establish an aviation climate fund with the state to stimulate demand for SAF and investment into its production.
United States roadmap			Under development

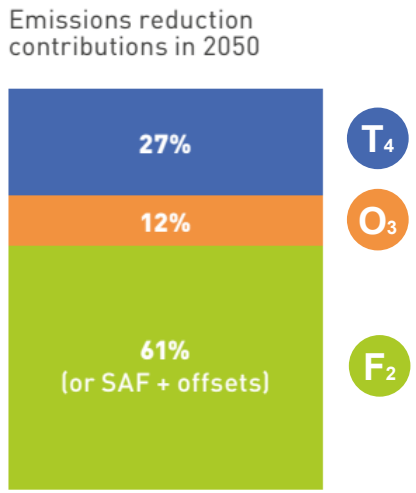
A lot of roadmaps have been developed over the past 18 months…. They a tell a similar story!

Waypoint 2050: the industry goal. A lot of SAF required

Scenario 1

Pushing technology and operations

Industry prioritises technology and operational improvements

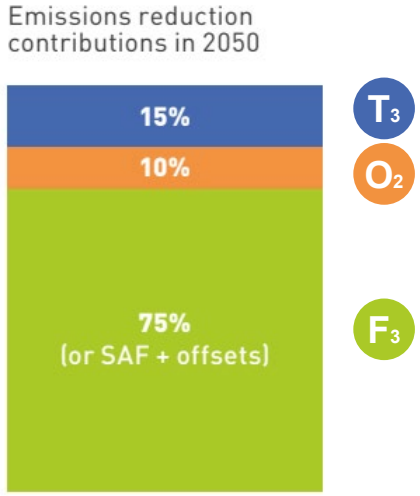


Electric and hybrid short-range (<100 seat) aircraft from 2035/2040. High-range operational improvements. 290-390 Mt of SAF by 2050.

Scenario 2

Aggressive sustainable aviation fuel deployment

Industry prioritises investment in sustainable aviation fuel over technology

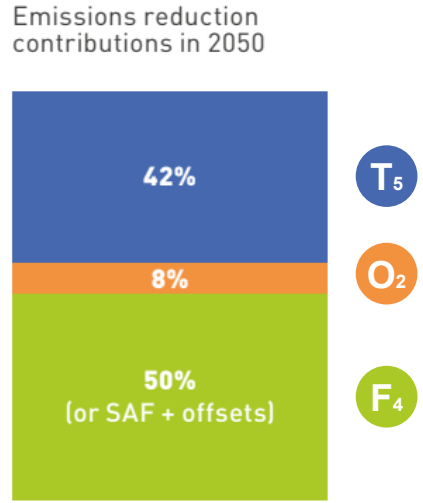


New airframe configurations such as blended wing body. Mid-range operational improvements. 350-450 Mt of SAF by 2050.

Scenario 3

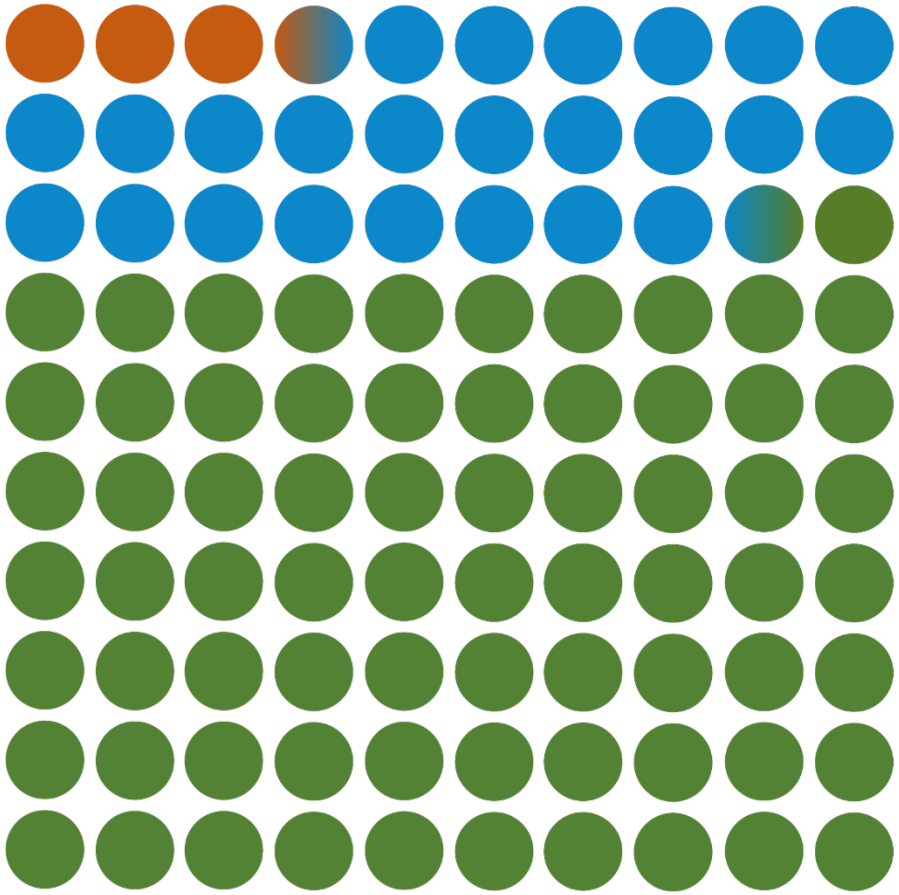
Aspirational and aggressive technology perspective

Highly ambitious technology developments: electric and/or hydrogen for up to 200 seat aircraft before 2035



Very aggressive zero emissions aircraft (electric, hydrogen) by 2035-2040. Mid-range operational improvements. 235-340 Mt of SAF by 2050.

SAF will do most of the decarbonizing, even with hydrogen and electric

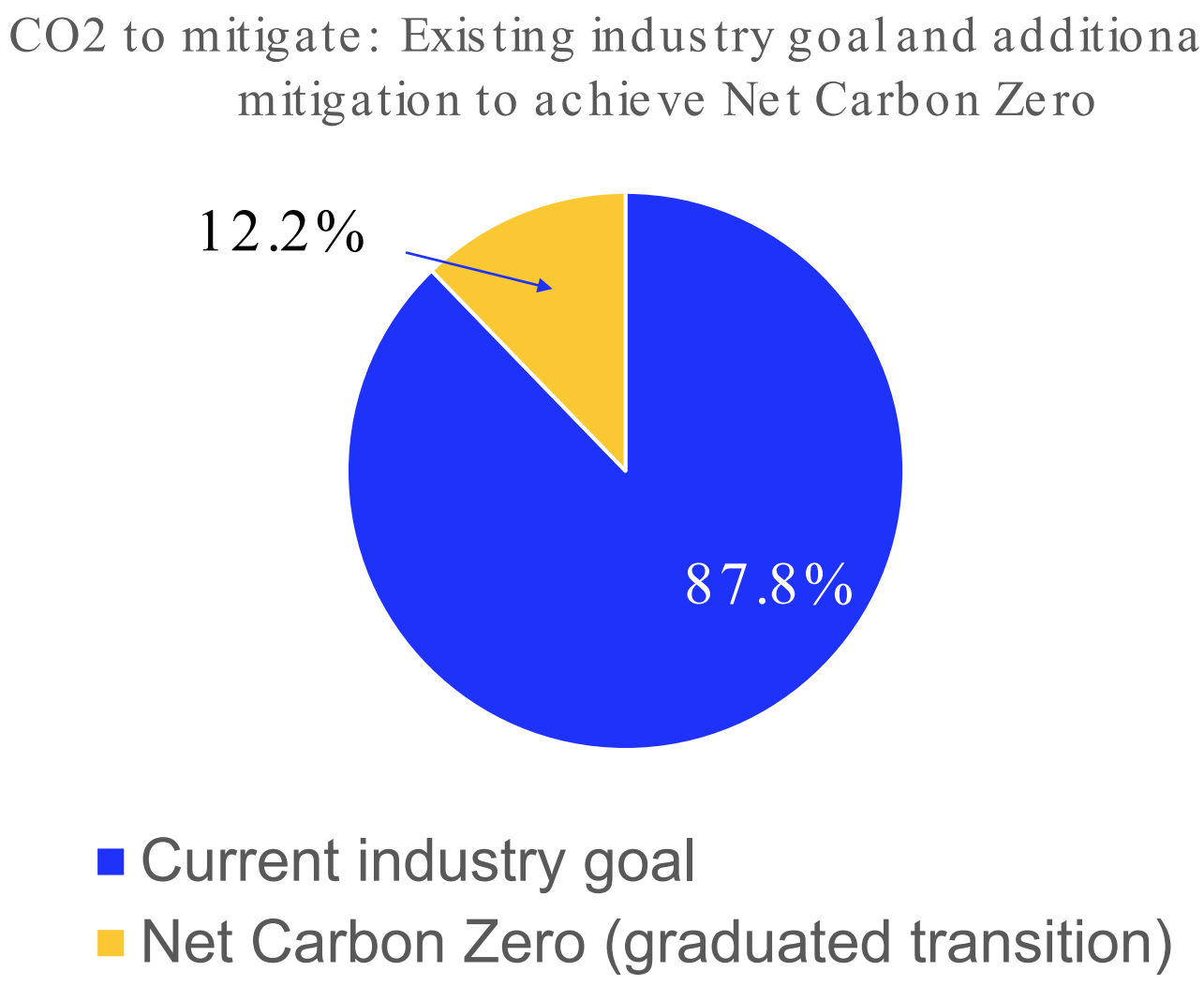


Even assuming highly optimistic use of **electric** and **hydrogen** energy for short-haul and some medium-haul operations in 2050, the vast majority of traffic (RPKs) will still rely on the use of **sustainable aviation fuel**.

2050 % of operations by energy source (indicative example)

ATAG schematic indication of potential energy use in 2050

Existing goal or Net Carbon Zero The journey to 2050:



Existing aviation commitments to net-zero / carbon neutrality 42% of Airlines by RPKs

2020

easyJet, DELTA

2040

jetBlue, FedEx, Alaska Airlines

2045

FINNAIR

2050

BRITISH AIRWAYS, IBERIA, LEVEL, vueling, Aer Lingus, CATHAY PACIFIC, American Airlines, QANTAS, virgin atlantic, ETIHAD AIRWAYS, SriLankan Airlines, royal air maroc, ROYAL JORDANIAN, S7 Airlines, QATAR AIRWAYS, DHL, UNITED, malaysia airlines, AIR NEW ZEALAND, ups, Southwest, ATLAS AIR, JAL JAPAN AIRLINES, Lufthansa, SWISS, brussels airlines, Austrian, Eurowings, AIR CANADA, HAWAIIAN AIRLINES, GOL, ANA, LATAM, SINGAPORE AIRLINES, ROLLS ROYCE, AIRLINES FOR EUROPE, Airlines for America We Connect the World, oneworld, SUSTAINABLE AVIATION, ASD AeroSpace and Defence Industries Association of Europe, era european regions airline association, EBAA, ae european express association Delivering a competitive Europe

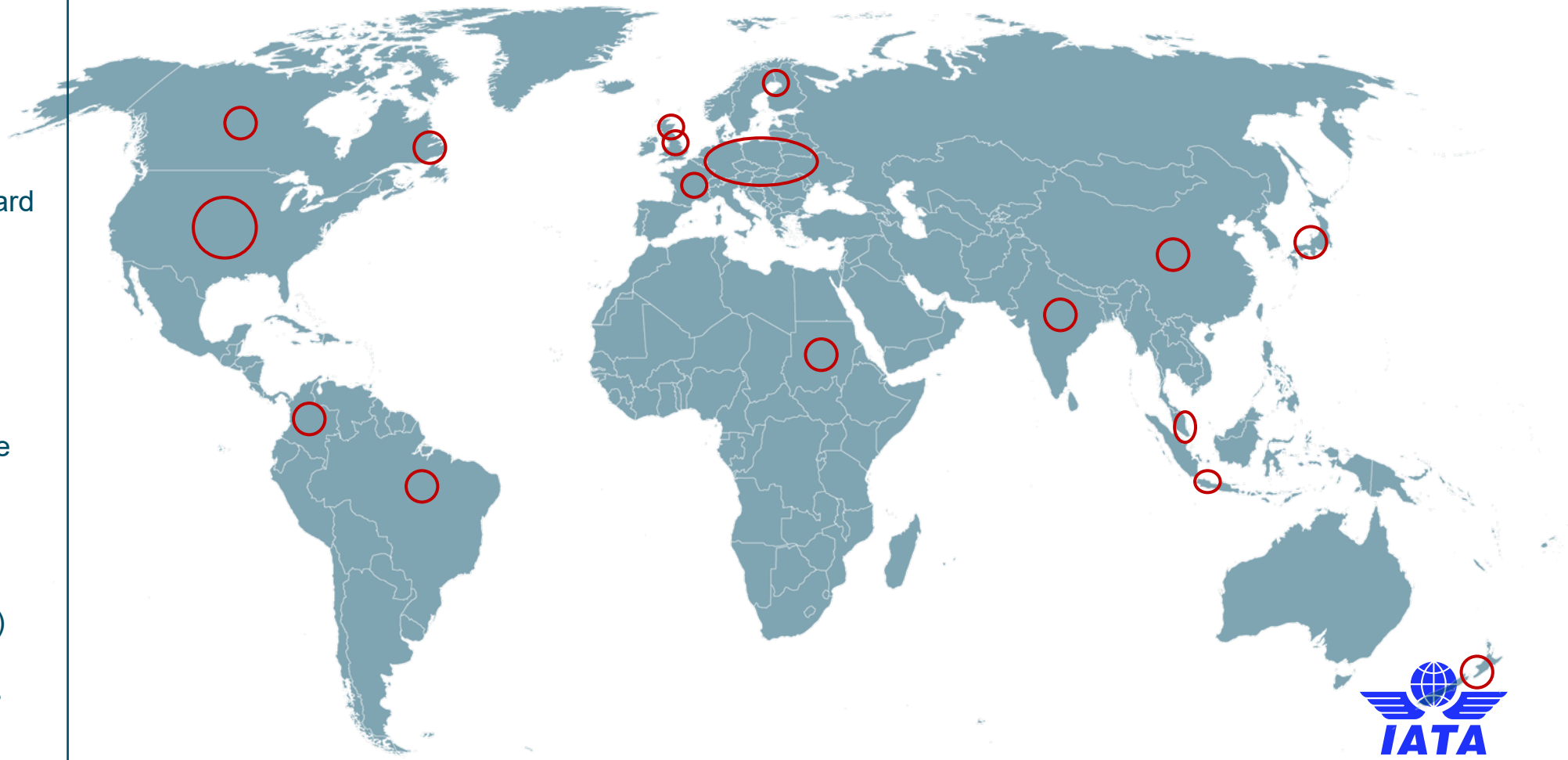
235 EU airports

Norway fossil free

SAF Policy - Significant activity in all parts of the world

Numerous global initiatives and policy discussions including:

- ReFuelEU
- UK Jet Zero Council
- COP26 (Glasgow)
- Canada Clean Fuel Standard
- Various US legislative proposals / discussions
- Country SAF mandates in Europe
- Nordic initiatives
- SAF initiative in Japan
- EU-China (H2020 Alternate Project)
- H2020 Alight project (SAF deployment best practice)
- NZ mandate inc SAF
- Indonesia mandate (SAF?)
- CST
- Various industry roadmaps
- ICAO (LTAG and CAAF/3)



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Outlook for SAF policy in Europe: Context

EU Green Deal: Announced December 2019

The EU Green deal proposes several policy ideas that concern aviation

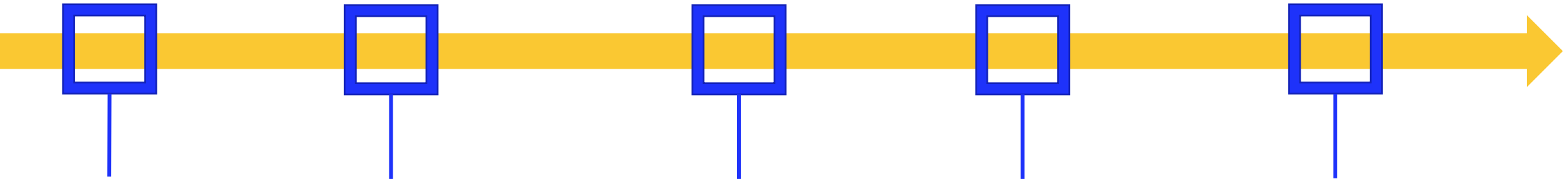
Specifically for SAF:

- Consider legislative options to boost the production and uptake of sustainable alternative fuels for the different transport modes

ReFuelEU:

- The sub-set of the Green Deal that specifically focuses on aviation is referred to as ReFuelEU.

EU SAF Policy: ReFuelEU



December 2019:
Green Deal Announced

April 2020:
ReFuelEU Inception Impact Assessment

August – October 2020:
ReFuelEU Consultation

July 2021:
Legislative Proposal expected

Rest of 2021
Co-decision procedure

How to be prepared for the ReFuel policy?

Refuel EU Aviation – EC Policy Options under consideration

Yellow = we could support under certain conditions
Green = we support
Red = we do not support

Option	Obligation	Scope	Target	Additional points
Option A1	on supply	intra and extra-EEA	Volumes of SAF	A sub-mandate on green synthetic fuels is foreseen from 2030 onwards.
Option A2	on supply	intra and extra-EEA	Reduction in GHG intensity of fuels on a well to wing basis	Incentives for green synthetic fuels are foreseen to bridge the price gap with advanced biofuels.
Option B1	on demand	intra and extra-EEA	Volumes of SAF	A sub-mandate on green synthetic fuels is foreseen from 2030 onwards A “book and claim” system is put in place
Option B2	on demand	intra-EEA	Volumes of SAF	A sub-mandate on green synthetic fuels is foreseen from 2030 onwards. A “book and claim” system is put in place.
Option C1	on supply and demand	intra and extra-EEA	Volumes of SAF	A sub-mandate on green synthetic fuels is foreseen from 2030 onwards on the fuel suppliers. A “book and claim” system is put in place.
Option C2	on Supply and demand	intra and extra-EEA	Reduction in GHG intensity of fuels on a well to wing basis	Fuel suppliers are free to organise their logistics in the most cost -effective way. Incentives for green synthetic fuels are foreseen to bridge the price gap with advanced biofuels for fuel suppliers. Airlines are obliged to achieve a minimum GHG emission saving over the total jet fuel used for intra -EEA flights on a yearly basis. A “book and claim” system is put in place.

Refuel: What does it really mean?

- A mandate of 2% from 2025 (intra and extra EU volume) would be approximately: **400 million gallons**

- Continued expansion of supply will be necessary

- **Book and Claim accounting** with help airlines / suppliers, regulators and the environment

- Still many unanswered questions ….

UK – Jet Zero Council

Objective: *The Jet Zero Council (JZC) is a partnership between industry and government to bring together ministers and chief executive officer -level stakeholders, with the aim of delivering zero - emission transatlantic flight within a generation, driving the ambitious delivery of new technologies and innovative ways to cut aviation emissions.*

Delivery groups:

Sustainable Aviation Fuels (SAF)

The SAF Delivery Group provides advice on how government and industry can work together to establish UK production facilities and accelerate the delivery of the fuel to market. It is currently focusing on 4 specific areas:

- development of a SAF mandate
- commercialisation of SAF
- technologies and feedstocks required for SAF production
- supply of SAF at UK airports for COP26

IATA Sustainable Aviation Fuel Symposium (10 June)

https://www.iata.org/en/events/alternative-fuels-symposium/

Topics will include:

- SAF technical and commercial progress
- The political landscape including policy discussion
- SAF initiatives from Airlines (logos below)
- A comparison of industry roadmaps
- Emerging SAF technologies
- How to tackle the challenges for more rapid commercial deployment