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ICAO “Guidance on Potential Policies and Coordinated Approaches for the deployment of Sustainable Aviation Fuels”

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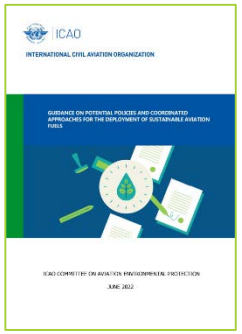
Introduction



- SAF production capacity is limited by a number of barriers
  - Higher costs
  - Limited feedstock and fuel production infrastructure
  - Perceived financial risks
- In the presence of such barriers, policy intervention is required to develop SAF production
  - In general, a supporting policy framework is in place in those states where SAF production has initiated
- Constraints and opportunities are specific to each State
  - Specific climates, agricultural systems, available resources, economic factors, political contexts, regulatory structures, etc.

→ Successful SAF policy making may require a customized strategy specific to each State's own circumstances

ICAO Guidance on Potential Policies and Coordinated Approaches for the deployment of SAF

- Developed by CAEP based on studies performed since 2016
- A support reference for ICAO States to develop SAF production
  - Insight on types of policy measures and their impacts
  - Examples of policies used or under preparation
  - Links to additional helpful resources
- Completes a toolbox of guidance material for ICAO States
- Can be used in combination with the ICAO SAF Rules of Thumb

Publically available on the ICAO website

Guidance document

https://www.icao.int/environmental-protection/Pages/saf_guidance_potential_policies.aspx

SAF rules of thumb

https://www.icao.int/environmental-protection/Pages/SAF_RULESOFTHUMB.aspx

ICAO Guidance on Potential Policies and Coordinated Approaches for the deployment of SAF

- Long-term, stable policies are necessary to create a sustained market for SAF.
- The best policies for SAF development are likely to vary for each State and region based on their unique combination of climate, resources, political, social and economic factors :
  - States with already well-developed renewable energy policies (e.g. for ground transportation) or carbon legislation, there may be an opportunity for inclusion of SAF in those existing mechanisms.
  - For States that are looking to support renewable energy for the first time, there is an opportunity to take a well thought out and planned approach that best fits a State's circumstances.

What defines an effective SAF policy? (1/2)

Three key themes influence policy effectiveness:

1. **Feasibility**: practicable and easy to implement
2. **Effectiveness**: successful in producing a desired result
3. **Practicality**: the policy targets the outcome rather than a theory or set of ideas

What defines an effective SAF policy? (2/2)

To be effective, SAF policies/programmes should be:

- **Stable**, predictable and consistent in implementation
- Be of a **sufficient duration** to reflect project development timelines
- Be "**stackable**" with other incentives – i.e., allowing credit to be received from multiple reinforcing incentives at the same time is helpful
- Be **technology-neutral**
- Link **incentives** to **performance**
- Allow access to a **compliance credit market** to mediate prices between renewable fuels and fossil fuels by ascribing a compliance value
- Recognize **needs of pre-revenue companies** through clear access to non-dilutive capital via grants and loans.
- **Ambitious** to support aviation decarbonisation and **drive further innovation**
- Ideally, be national in **scope** to allow innovation and project development where it can be accomplished most effectively
- Designed with **broad political support** to avoid sudden policy reversals.
- **Customized** to the specific circumstances of the State

Qualitative metrics for assessing policy effectiveness (1/2)

The following metrics can be used as a “check-list” to assess policy effectiveness:

1. **Flexibility**
   - Can the policy be easily adjusted given evolving circumstances?
2. **Certainty**
   - Relates to the time frame, legal conditions and/or political decisions.
   - Medium to long-term policy certainty tend to increase investor interest.
3. **Financial cost and benefits**
   - Policy effectiveness should consider costs and benefits, including social costs.
4. **Price sensitivity to externalities**
   - The higher the sensitivity to externalities, the more potential unintended consequences.
   - Price-based policies can be less volatile if a floor and ceiling price is established.

Qualitative metrics for assessing policy effectiveness (2/2)

The following metrics can be used as a “check-list” to assess policy effectiveness:

5. **Ease of implementation**
   - Administrative, governance and/or procedural complexity can hinder implementation
6. **Contribution to SAF deployment and GHG reduction**
   - clear criteria on target quantity, sustainability, commercial parameters and timeframe improve results
7. **Unintended consequences**
   - mechanisms to identify and mitigate the impact of unintended consequences (economic, environmental or social)
8. **Robustness of policy**
   - regulating systems to ensure that policy objectives are achieved and procedures have been followed

ICAO Guidance on Potential Policies and Coordinated Approaches for the deployment of SAF

Grouped broadly, policy mechanisms can:

- **Stimulate growth of the SAF Supply**
  - e.g. via R&D, investment, finance
- **Create SAF demand**
  - e.g. via mandates, subsides and commitments
- **Enable the SAF marketplace**
  - e.g. via standards

Comparative analysis tools

1. ICAO SAF Rules of Thumb

Provides order of magnitude estimations on SAF costs, investment needs and production potential. It can be used to inform policymakers and project developers.

Provides the impact of feedstock cost, fuel yield, facility scale, total capital investment and minimum selling price for both the n^{th} plant and a pioneer plant.

Provides **big-picture trends** for costs and processing technology/feedstock comparisons

However, they **do not** provide precise cost or price information.

Processing Technology	Feedstock	Feedstock Cost ($/tonne)	Feedstock Cost ($/L)	TCI (million $)		MSP ($/L)	
				n^{th}	pioneer	n^{th}	pioneer
GFT	MSW	0	-	1170	724	0,7	1,8
GFT	Forest Residues	125	-	1636	1063	1,8	3,3
GFT	Agricultural Residues	110	-	1506	1238	2,1	3,8
ATJ	Ethanol	456	0.36	333	99	0,8	1,0
ATJ	Isobutanol - Low	1110	0.89	343	67	1,3	1,4
ATJ	Isobutanol - High	1496	1.20	424	75	1,8	1,9
HEFA*	FOGs	580	-	428	112	0,8	1,0
HEFA*	Vegetable Oil	809	-	431	108	1,1	1,2

https://www.icao.int/environmental-protection/Pages/SAF_RULESOFTHUMB.aspx

Comparative analysis tools

2. Determining the marginal abatement cost of CO2 mitigation using SAF

Evaluating the cost of abating 1 ton of CO2 with the use of SAF can be valuable for a policy maker to assess the effectiveness of a specific policy relative to other alternatives (fleet renewal, ATM operations improvement, etc.)

Cost of 1 tonne of conventional kerosene = $600

Cost of 1 tonne of SAF = $1100

Jet fuel combustion CO_2 emissions factor = 3.16

CO_2 emissions reduction factor of this SAF = 80%

Firstly, the amount of CO_2 reduced must be determined which is a function of the amount of SAF used, the jet fuel combustion factor and the SAF emissions reduction factor.

Net CO_2 emissions reduction = 2 tonnes * 3.16 * 80% = 5.06 tonnes CO_2

The cost per tonne of CO_2 reduced is found by calculating the cost difference between SAF and conventional kerosene divided by the amount of CO_2 reduced.

Cost per tonne of CO_2 reduced = 2 tonnes * (1100-600) / 5.06 = $197.78 / tonne

How do policies impact SAF project economics?

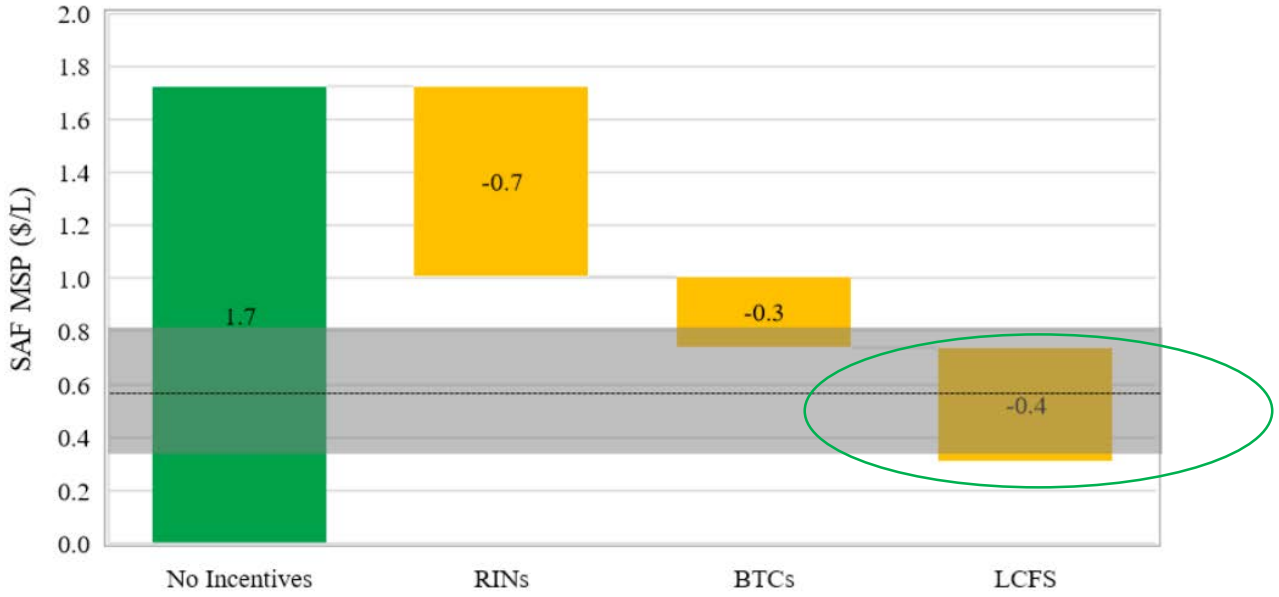
The guidance proposes 5 simplified examples to illustrate the effects of policies on the **economic viability of a SAF project** (no support, grant, interest-free loan, subsidy, and combination thereof).

EXAMPLE: 5	*Simplified cost-benefit example - project grant*										
Project analysis (Million USD)											
Year	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Capital costs											
Project construction	-250										187.5
Project grant	50										0
Interest free loan	100										-100
Improvements						-25					17.5
Equiptment	-10					-10					5
Total	-110	0	0	0	0	-35	0	0	0	0	110
Operating costs											
Aggregate annual costs		-5	-15	-20	-20	-20	-20	-20	-20	-20	-20
Revenues											
Subsidy		1.5	2.5	4	4	4	4	4	4	4	4
Annual aggragate revenues		15	25	40	40	40	40	40	40	40	40
Net Cash Flow	-110	11.5	12.5	24	24	-11	24	24	24	24	134
Discount rate	9%										
NPV	**$46.59**										
IRR	**15%**										

This interactive modelling tool will be available on the ICAO website, for policy makers to explore the economic effects of various policies on a SAF project.

How do policies impact SAF Minimum Selling Price?

The guidance proposes 5 examples to illustrate the effects of policies on the minimum selling price (MSP) of SAF for a given plant.



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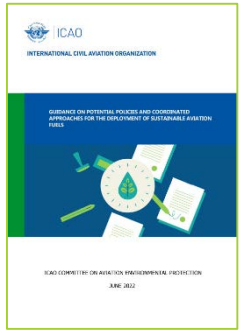


Policy examples extracted from the Guidance - EU, US, UK

Among others, the European Union, the United States and the United Kingdom have developed/are developing their own SAF strategies/policies*

1. European Union
   - EU-wide SAF mandate with obligations on fuel suppliers to distribute increasing shares of SAF at EU airports from 2025 onwards.
2. United States
   - Multi-agency SAF Grand Challenge Roadmap
   - IRA legislation includes the Sustainable Aviation Fuel Credit ("SAF blenders tax credit") of $1.25 per gallon of SAF achieving at least 50% GHG emissions savings vs fossil jet fuel (2023-2024)
   - Clean Fuel Production Credit, up to $1.75 per gallon of SAF (2025-2027)
3. United Kingdom
   - UK is preparing a SAF mandate from 2025 onwards. Obligation on fuel suppliers to reduce the GHG emission of aviation fuel by the equivalent of at least 10% SAF use by 2030.
   - Government support with Advanced Fuels Fund competitions (165 million) launched in July 2022, with the aim to have at least 5 commercial-scale SAF plants under construction by 2025.
   - Establishment of a "Jet Zero Council SAF Delivery Group".

*Some of the policies listed above may still be in the process of preparation/validation.

Policy elements may not be definitive and could still evolve.

ICAO CAAF/3 PROCESS AND TIMELINE

28 March 2023
Council Informal Meeting (Financial Institutions)

13-14 Apr: EUR-NAT
18-19 Apr: ESAF/WACAF
24-25 Apr: NACC/SAM
3-4 May: APAC
7-8 May: MID

April - May 2023
ENV Regional Seminars (5 events)

24 May 2023
Launch of ICAO-EU ACT-SAF Project

15 and 20 June 2023
Council Informal Meetings (Banks/Investors and Energy Companies)

11-13 July 2023
Pre-CAAF/3 Stocktaking, and Policy / Finance Consultations

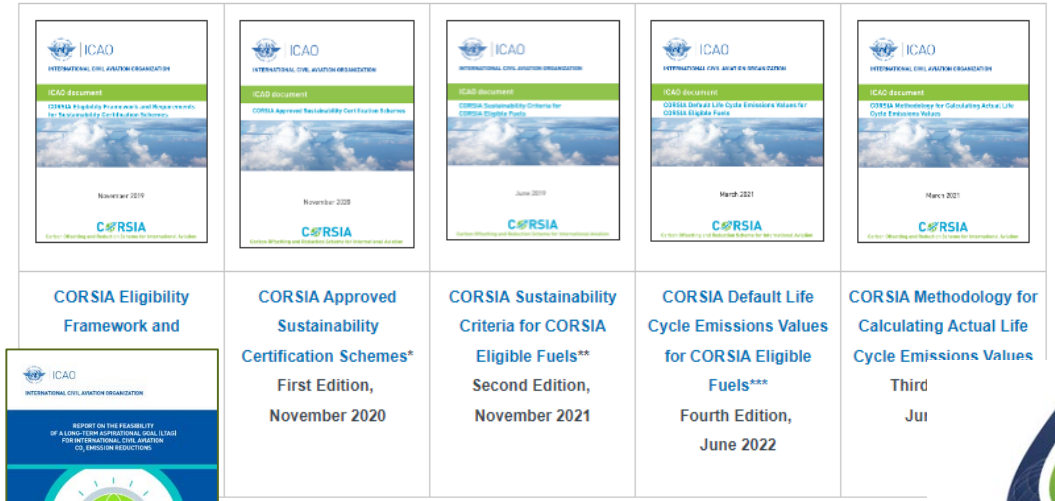
25-26 Sept 2023 (TBC)
Pre-CAAF/3 Outcomes Consultations

21-24 Nov. 2023
CAAF/3





More information on SAF on the ICAO website



CORSIA Eligibility Framework and

CORSIA Approved Sustainability Certification Schemes* First Edition, November 2020

CORSIA Sustainability Criteria for CORSIA Eligible Fuels** Second Edition, November 2021

CORSIA Default Life Cycle Emissions Values for CORSIA Eligible Fuels*** Fourth Edition, June 2022

CORSIA Methodology for Calculating Actual Life Cycle Emissions Values Third Ju

GFAAF

ımework for Aviation Alternative Fuels

SAF Tracking tools (click on the drops for details)

SAF facilities map

see the facilities (existing and announced) that can produce SAF

https://www.icao.int/environmental-protection/pages/SAF.aspx

(or google it "Sustainable Aviation Fuels")

Thank You!

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