



ICAO

ENVIRONMENT

ICAO Secretariat

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## Session 4 – Financing Cleaner Energies

# Agenda



## Session 4 – Financing Cleaner Energies

### ➤ **CAAF/3 Global Framework: Building Block 4**

- Introduction to Building Block 4 – Financing
- Assembly request on financing
- Advocacy and outreach activities
- Basics of SAF projects financing
- Operationalization of ICAO FINVEST Hub

### ➤ **States and stakeholders' presentations and views**

### ➤ **Q&A session**



# ICAO Assembly Request on Financing

# ICAO Assembly request on Financing



## LTAG financing – A41-21 requests to Council

18.

a) initiate specific measures or mechanisms so as to facilitate, in particular for developing countries and States having particular needs, better access to private investment capacities, as well as funding from financial institutions, such as development banks, for projects contributing to the decarbonisation of international aviation, as well as encourage new and additional funding to this purpose;

b) further consider the establishment of a climate finance initiative or funding mechanism under ICAO, while addressing the possible financial, institutional and legal challenges, and report to the 42nd Session of the ICAO Assembly.

(...)

28. d): Requests the Council to work with financial institutions to facilitate access to financing infrastructure development projects dedicated to SAF and LCAF and incentives to overcome initial market hurdles;

# CAAF/3 Global Framework – 4 Building Blocks

## 1. Policy and Planning

- Global aspirational **Vision** to reduce international aviation CO<sub>2</sub> emissions by **5% by 2030**
- Each State's **special circumstances and respective capabilities**
- **CAAF/4** no later than 2028, with a view to update Vision
- **Collaborative effort** across different stakeholders, and encourage **State policies, action plans and roadmaps**
- Implementation **monitored** and periodically **reviewed**

## 2. Regulatory Framework

- **CORSIA eligibility framework as accepted basis** for SAF, LCAF and other aviation cleaner energies
- Increase the **number of SCS**, additional fuel production **pathways / life-cycle values**
- Parameters for **fuel accounting methodologies**, leveraging on CORSIA MRV system
- **Study of fuel accounting systems** to determine any possible ICAO role

## 3. Implementation Support

- **Robust, targeted and tailored** capacity -building and implementation support
- **Building on ACT-CORSIA and ACT-SAF programmes**
- Facilitate **partnerships**, and exchange of best practices
- Develop **policy toolkit/guidance** and support **State Action Plans**
- Support **feasibility studies, pilot projects**, which may facilitate access to investment
- Support **access to technology**

## 4. Financing

- **Advocacy and outreach** for greater investment in aviation cleaner energy projects, including UN and international financial community
- Welcome and request for **operationalization of ICAO Finvest Hub** to facilitate better access to public fund / private investment, to respond to Resolution A41-21, para 18. a)
- Expedite work to **consider the establishment of a climate finance initiative or funding mechanism under ICAO**, to respond to A41-21, para 18. b)

# Building Block 4 – Financing

## 4. Financing

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30. Some financing instruments (e.g. blended finance and Public-Private Partnerships) require significant cooperation and collaboration between stakeholders, including States, industry and public and private financial institutions, to mitigate the investment risk. There is a role for ICAO and its Member States to engage in this cross-stakeholder collaboration as appropriate, on possible measures to de-risk investments.

38. States recognize the important role that ICAO can play in encouraging scaled up funding flows, including new and additional funding flows, as appropriate, and their transparent and effective disbursement. ICAO and its Member States need to ensure ‘no stone is left unturned’ in exploring avenues to support these objectives.

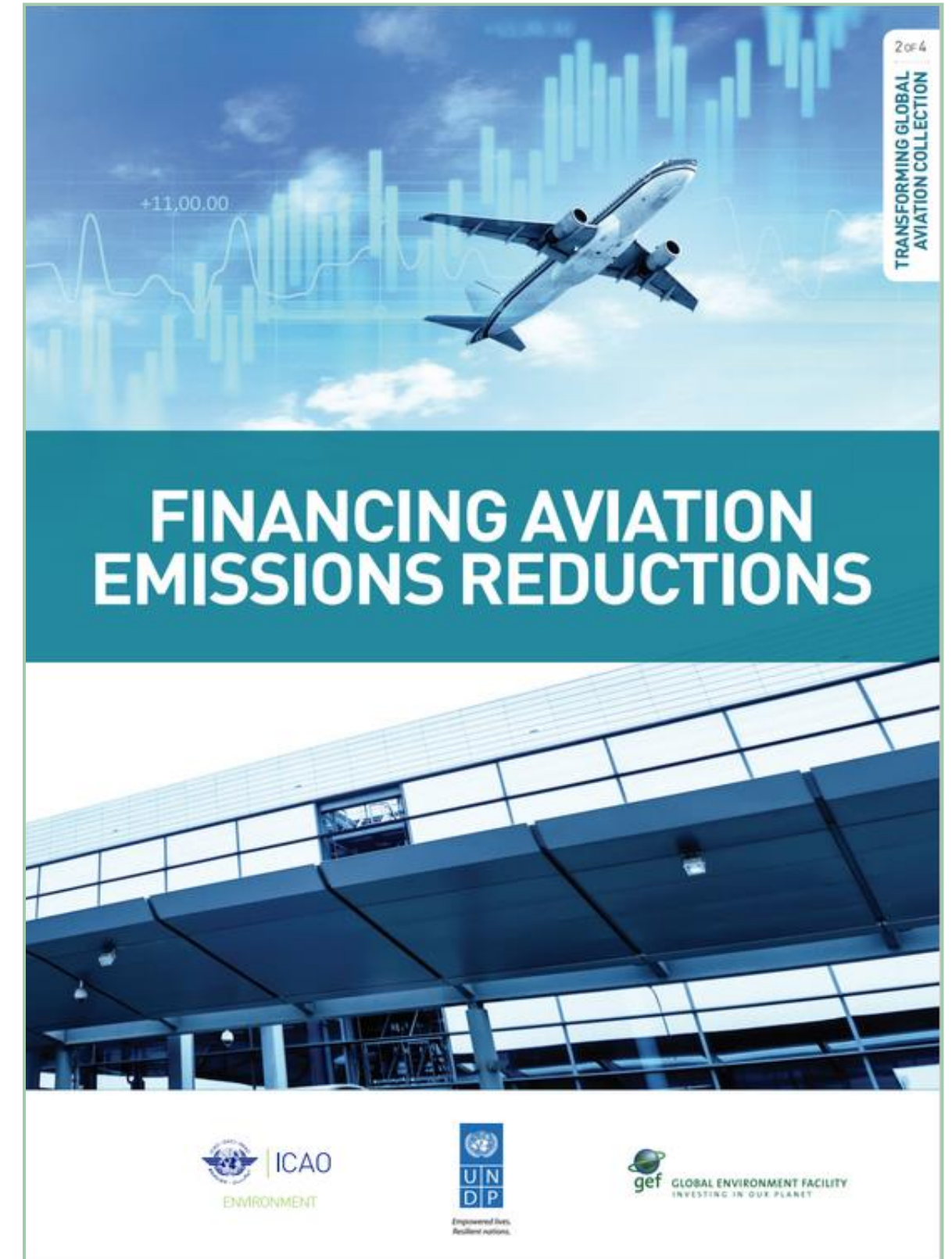
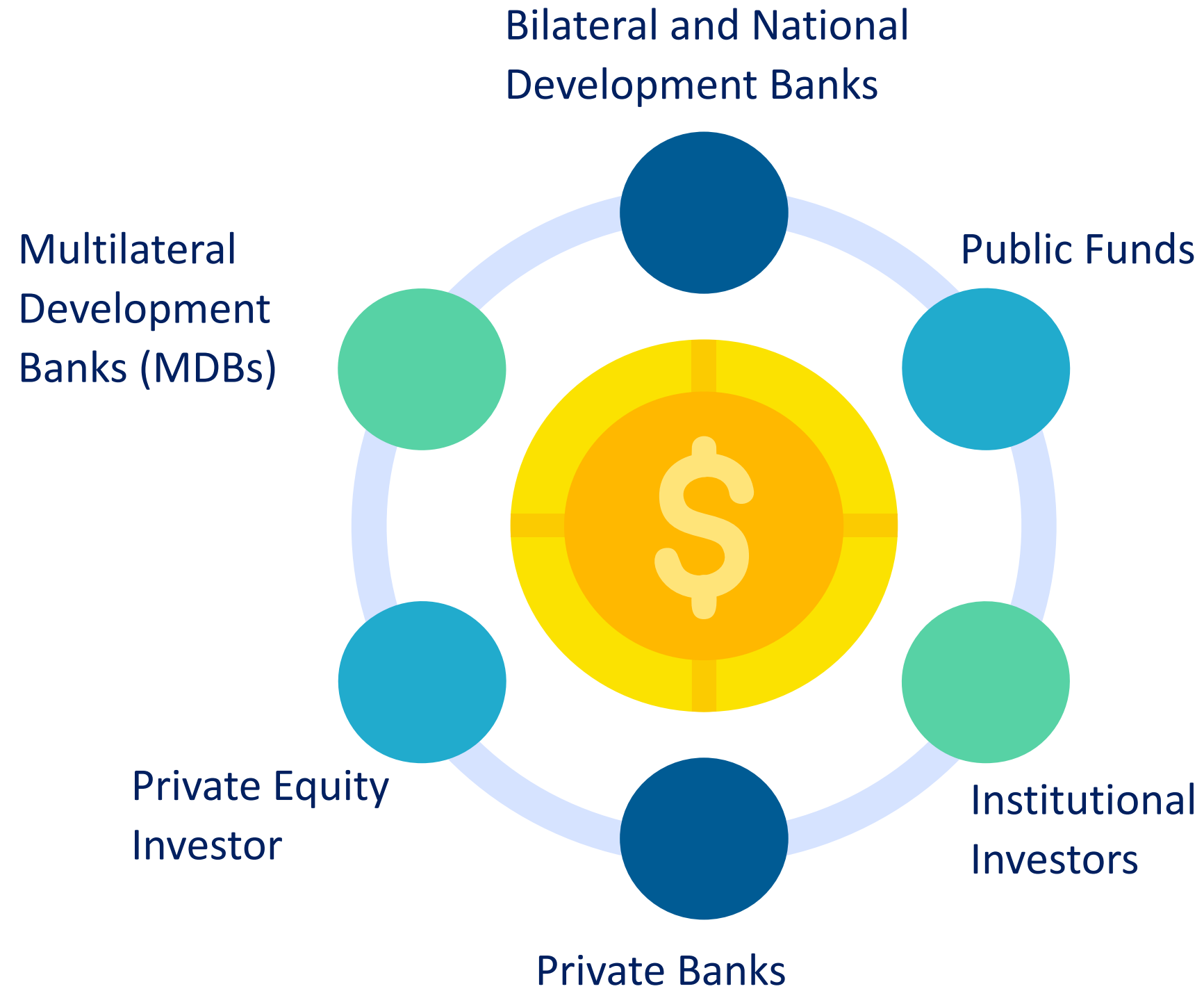
42. ICAO and its Member States should initiate a work stream to actively identify, analyse gaps and monitor developments in the UN and across the international financing community, including *inter alia* the Green Climate Fund and its upcoming replenishment, the Net Zero Asset Owner Alliance, and the Multilateral Development Banks Vision Statement, to identify and aggressively pursue opportunities to increase the allocation or earmarking of public and private capital devoted to aviation decarbonization projects, particularly on SAF, LCAF and other aviation cleaner energies.

34. States acknowledge and welcome the establishment of the ‘ICAO Finvest Hub’, which delivers on Assembly Resolution A41-21, paragraph 18. a), and look forward to its work to facilitate enhanced access to public and private investment capacities and funding from financial institutions, with prioritization of allocation to developing countries and States with particular needs, for projects contributing to the decarbonization of international aviation, including for the scale-up in development and deployment of SAF, LCAF and other aviation cleaner energies, as well as encourage new and additional funding for this purpose.

35. As a first step, ICAO should urgently put in place the necessary structure and capability, toward the operationalization of the proposed ‘ICAO Finvest Hub’ initiative. Such work should clearly identify how the Finvest Hub initiative complements broader aviation decarbonization capacity building and implementation efforts, including the ACT-SAF programme.



# Diverse sources of Financing





# Financing the Long Term Global Aspirational Goal (LTAG)

- ICAO Assembly Resolution, A41-21, paragraphs 18. a), b)
- ICAO Global Framework, paragraphs 31 to 42

**LTAG Report – Financing costs and investments across stakeholders**  
**Projected cumulative (2020-2050) costs and investments associated with highest-ambition LTAG scenario, across each stakeholder group**



Stakeholders	Integrated Scenario 3
States	\$160b
Air Navigation Service Providers	\$20b
Aircraft manufacturers	\$350b
<b>Fuel suppliers</b>	<b>\$3,200b</b>
Airports	\$125b

**Note:** Some investments from upstream stakeholders are passed on downstream (e.g. airline operators) in the form of incremental price of products

# ICAO Advocacy and Outreach Activities with Financial Institutions





# Objectives of ICAO Advocacy and Outreach Activities

ICAO is connecting with financial institutions across regions with the objectives to:

1. Raise awareness of financial institutions on the role of SAF to achieve the LTAG, and on the interest of aviation/fuel industries for immediate and massive SAF scale-up;
2. Inform financial institutions of the significant investments needs to scale-up SAF production capacity across all regions, in particular for developing countries.
3. Explore financial institutions' existing or future financing instruments to support SAF deployment and inform financing institutions of ways in which they can best contribute to SAF deployment.



# ICAO's Council dialogues with the financing sector and energy providers (March – June 2023)





## 2023 ICAO Stocktaking Event (July 2023)

- **Pre-CAAF/3 Policy and Finance Consultation**
- **Full day dedicated to financing**
  - Financing the achievement of the LTAG
  - Recent investments in new SAF production facilities
  - Strategic regional and global alliances between stakeholders and investors
  - Implementation support to unlock financing: adoption of roadmaps, capacity building and funding of feasibility studies





# Examples of Financing Opportunities

## Asian Development Bank

- Non-sovereign finance window of \$4.5bn in 2020 to stimulate private sector investments, including in renewable energy projects (25% of project cost covered).

## Bank of America

- Mobilizing \$2 billion in sustainable finance for the production of SAF and other low-carbon aviation solutions.

## Green Investment Group

- USD 30+bn committed and arranged to support green energy projects by Q1 2021.

## Green Climate Fund

- USD 11.3bn committed through a range of financing instruments, including on energy and transport projects.

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## First Abu Dhabi Bank

- Committed to facilitate sustainable financing of more than USD 75 billion by 2030, with aviation/SAF being a key topic.

## Banque de Montreal

- Sustainable financing guarantee programme sharing 50% of the risk up to USD 60m on loans. Bio energy, CCS and hydrogen are eligible sectors.

## Brazil Development Bank

- Climate Fund is open for clean energy investments and comes with low interest rates and a ceiling of 80 million Reals



## Industry initiatives and alliances

Many alliances and initiatives support the financing of sustainable aviation fuels. Examples include the following:

- **Clean Skies for Tomorrow** is an initiative supported by the **World Economic Forum** including actors of the aviation and energy industries, aiming to align on a transition to sustainable aviation fuels as part of a meaningful and proactive pathway for the industry to achieve carbon-neutral flying.
- **Renewable and Low-Carbon Fuels Value Chain Industrial Alliance** is an initiative of the European Commission, which gathers stakeholders from across the transport fuels and other relevant value chains, including financing institutions. Objectives of the alliance include to identify pathways for access to finance and fund the scaling-up of SAF.
- The **Sustainable Aviation Buyers Alliance (SABA)** aims to accelerate the path to net zero aviation by driving investment in and adoption of sustainable aviation fuel.
- The **Net-Zero Banking Alliance** has working groups involving financing institutions, aiming to define roadmaps for actors of the economy to decarbonize their activities thanks to the financing of SAF.



# Dialogues with Financial Institutions

- **Main takeaways from the dialogues:**
  - **Strong interest** from banks for decarbonization of aviation and deployment of SAF
  - **Transition towards SAF is key;** it will require significant investments across all world regions
  - Both public and private investments will have a key role
  - **Blended finance (public and private)** can act as a catalyst to de-risk SAF projects
  - **Clear criteria and harmonized frameworks for SAF financing** will support IFIs' analysis of SAF projects and facilitate investments.
- **Predictability of SAF offtakes and reliability of the regulatory landscape** are essential to provide confidence to investors and reduce risk



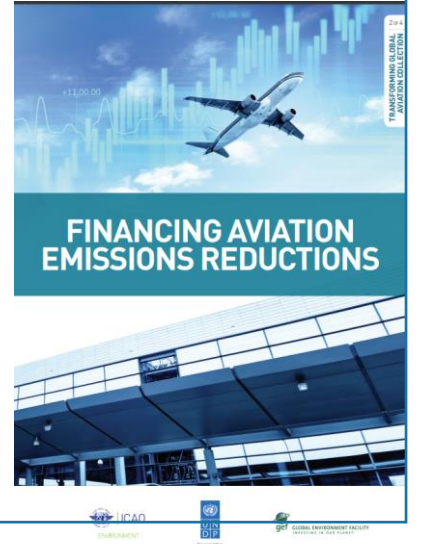
# Basics of SAF Projects Financing

# ICAO Guidance Material on Financing

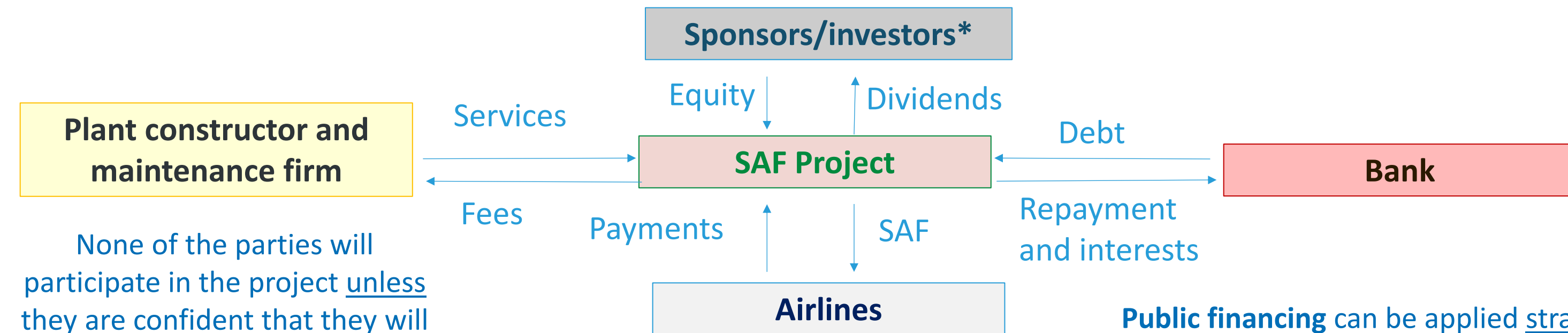


## ICAO Guidance on financing Aviation Emission Reductions – guidance on how to finance projects to reduce CO2 emissions from international aviation activities

Available at <https://www.icao.int/environmental-protection/Pages/financing.aspx>



### Basics on SAF project financing



None of the parties will participate in the project unless they are confident that they will **earn an adequate return on their investment** for their effort

**Public financing** can be applied strategically in the development of a project where there exist market weaknesses **to support project success.**

\* Investors can be a large variety of actors, including banks, airlines, SAF producers, and many others



# Equity and debt financing

**Equity and debt are the two primary options for financing project construction**

- The percentage of equity versus debt can vary depending on available resources and the cost of borrowed money.
- Interest rates on loans are determined by the creditworthiness of the borrower and the risk of the project to generate sufficient revenue for repayment.
- To finance a first project, the cost of borrowing may be high, but if this project is successful, the cost of borrowing to finance an  $n^{\text{th}}$  project will likely decrease.
- Where States have higher credit ratings resulting in higher interest rates, public financing through organizations (e.g. World Bank) can provide concessionary loans to improve project economics in developing countries.

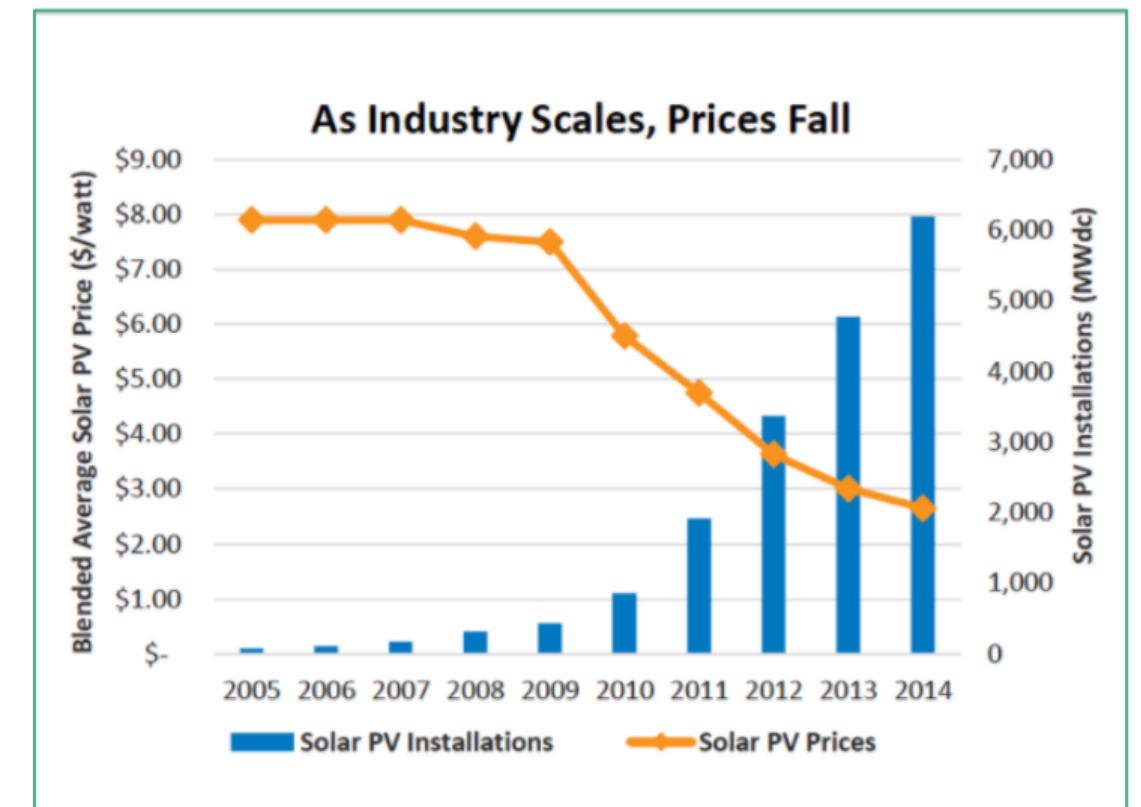




# Relationship between public and private financing

**Public** and **private** financing are both important in developing SAF projects.

- The amount of public financing depends on the maturity of the project. Too much public financing can crowd out private sector investment, but insufficient public financing presents a high risk to private sector investments.
- Public financing is initially required to create markets, but as markets mature, the role of public financing should decrease, and private sector financing should meet the investment needs.
- Private capital is easier mobilized when projects are forecast to produce sufficient revenue to repay outstanding obligations and provide a return on investment.



**Both public and private investments are currently needed to scale up SAF production**



# Examples of public and private financing

Industry actors (airlines, SAF producers, others) resort to various financing strategies to invest in SAF.

On August 7, 2014, Cathay Pacific Airways, a Hong Kong-based airline, announced that it has made a strategic equity investment in Fulcrum BioEnergy Inc., a U.S.-based leader in the development and commercialization of converting municipal solid waste into sustainable aviation fuel. Cravath represented Cathay Pacific in connection with this transaction.

## United Airlines Launches \$100 Million Investment Vehicle for SAF

Governments and organisations also deploy financing instruments to kick-start their domestic market

3 June 2022

## Neste signs a green term loan agreement

Published in [Releases and news](#) under [Investors](#)

*Neste Corporation, Press Release, 3 June 2022 at 11:45 a.m. (EET)*

Neste has signed today a EUR 500 million green term loan agreement. The proceeds of the loan will be used to finance Eligible Assets and Projects in accordance with Neste's Green Finance Framework. The loan has a tenor of 3 years with two 1-year extension options.

International Airlines Group (IAG), the airline's parent company, is investing \$400 million over the next 20 years into the development of SAF and British Airways has existing partnerships with several companies to develop plants and purchase the sustainable fuel.

## Advanced Fuels Fund (AFF) competition winners

Each organisation will receive a share of £165 million for the development of sustainable aviation fuel (SAF) production plants in the UK. The following projects have been awarded funding.

## How LPO Can Support the Sustainable Aviation Fuel Grand Challenge

The Department of Energy today announced the **Sustainable Aviation Fuel Grand Challenge**, a government-wide effort to reduce the cost, enhance the sustainability, and expand the production and use of Sustainable Aviation Fuel (SAF). The effort is part of the Biden-Harris Administration's overall strategy to decarbonize the aviation sector by 2050. Read more in the [White House fact sheet](#).

Commercial-scale SAF projects that utilize innovative technology and avoid, reduce, or sequester greenhouse gas emissions and meet other program requirements may be eligible for loan guarantees under the LPO's Title 17 Innovative Energy Loan Guarantee Program. LPO has received strong interest from SAF project developers about the potential for DOE financing of SAF production facilities.





# Operationalization of the ICAO *FINVEST Hub*

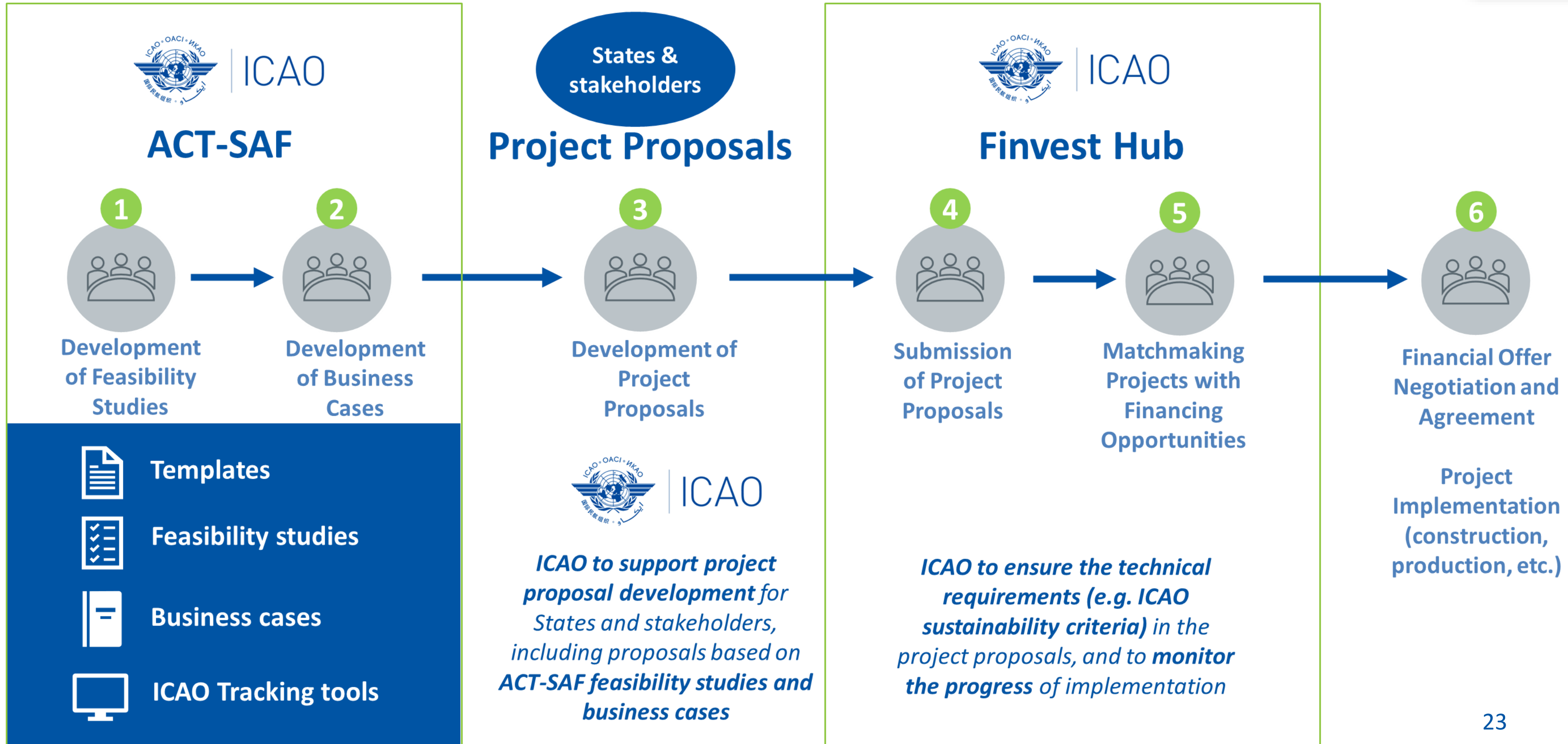


# Building Block 4 – Financing

## 4. Financing

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35. As a first step, ICAO should urgently put in place the necessary structure and capability, toward the operationalization of the proposed ‘ICAO Finvest Hub’ initiative. Such work should clearly identify how the Finvest Hub initiative complements broader aviation decarbonization capacity building and implementation efforts, including the ACT-SAF programme.
36. Key activities that the ICAO Finvest Hub could undertake include:
  - a) developing a platform to connect aviation decarbonization projects with potential public and private investors, including a ‘matchmaking’ function, thus helping investors to identify and assess projects;
  - b) working with various stakeholders to explore innovative funding and risk mitigation mechanism adapted to the decarbonisation of aviation, incentivizing investments, and promoting collaboration among stakeholders to mobilize financial resources effectively (e.g. fostering Public Private Partnerships);
  - c) collaborating with financial institutions, such as development banks, to create pathways for the funding of projects;
  - d) developing a database of funding and financing sources, together with their terms and conditions, for project developers to be able to draw on; and
  - e) developing a toolkit of term sheets templates (basic conditions to satisfy investors) for SAF, LCAF and other aviation cleaner energies.





# ICAO Roadmap Building Block 4 – Financing

## Planned Actions



## Planned Actions



- As part of **advocacy and outreach activities** regarding financing needs towards the achievement of the LTAG, to **enhance engagement and establish networks and structured dialogues with the international finance community and other relevant stakeholders** (Framework paragraph 32 refers) in order to identify and promote financing opportunities for funding projects related to decarbonization, particularly the development and production of SAF, LCAF and other aviation cleaner energies, especially in developing countries
- To develop **specific measures or mechanisms to facilitate better access to financing** (e.g. private investment capacities, as well as funding from financial institutions such as development banks) for developing countries and States having particular needs, in particular the **operationalization of the ICAO Fininvest Hub** (A41-21, para 18. a))
- ICAO and its Member States to initiate a work stream to actively identify, analyze gaps and monitor developments in the UN and across the international financing community (Framework paragraph 42 refers) to identify and aggressively pursue opportunities to increase the allocation or earmarking of public and private capital devoted to aviation decarbonization projects, particularly on SAF, LCAF and other aviation cleaner energies
- To conduct a study through the services of a third-party consultancy, regarding the **consideration of the establishment of a climate finance initiative or funding mechanism under ICAO**, while addressing the possible financial, institutional and legal challenges (A41-21, para 18. b)); support development of a report by the Council to the Assembly; and consider any further action as appropriate





## *Roles & Responsibilities, Timeframe*



- Secretariat to continue to undertake **advocacy and outreach**, including at the annual LTAG Stocktaking events, and further dialogues for the high-level exchange of views
- **By 2025**, the Secretariat to **operationalize the ICAO Fininvest Hub**, by **recommending to the Council possible options including in-house developments or partnerships** with Financing Platforms of other organizations, to facilitate financial access to aviation decarbonization project proposals, including project proposals developed **based on ACT-SAF feasibility studies and business cases**
- Regarding the consideration of the establishment of a climate finance initiative or funding mechanism under ICAO, **a selected third-party consultancy will deliver a study based on the TORs approved by the Council Small Group:**
  - ✓ Intermediary study (in 3 months from the start of the consultancy) and draft final study to the Small Group **by end of 2024**
  - ✓ Presentation to the Council **by early 2025**, before the final study to be delivered shortly thereafter
  - ✓ Based on the study, the Council will consider and approve its report to the deliberation of the **42nd Session of the Assembly**
  - ✓ Any further action can be considered, as appropriate, **after the Assembly**.



# Financing

## Q&A Session

# Next:



## Session 4 – Financing Cleaner Energies

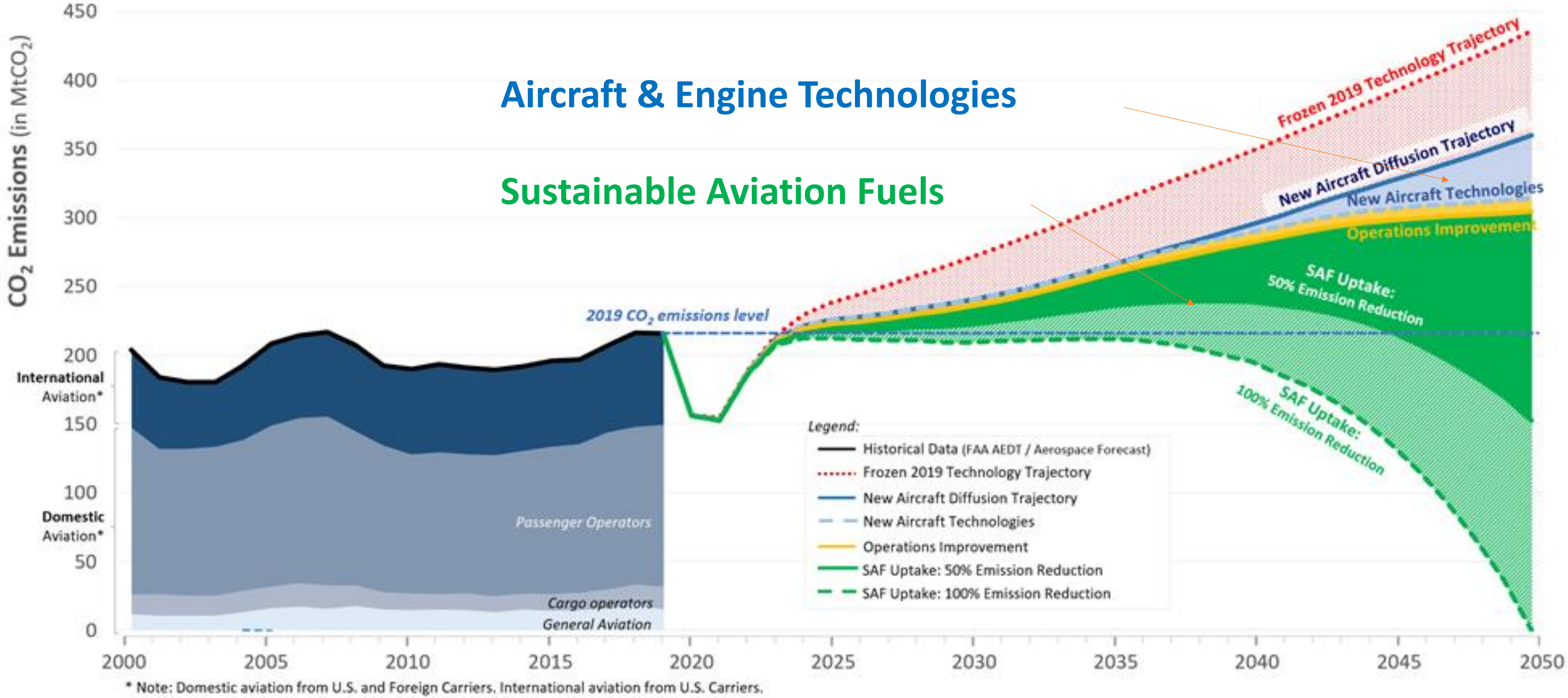
**States and stakeholders will share information and views regarding the need and opportunities for aviation decarbonization projects to have better access to financing and investment**



# Investments in Aviation Decarbonization

ICAO Environment Regional Seminar - NACC/SAM Region  
Nathan Brown, FAA Senior Representative for South America<sub>29</sub>  
August 20<sup>th</sup>, 2024

# Aviation Decarbonization Options



# The Path to Success on decarbonization

- Policy action & political commitment to stimulate investment and incentivize adoption
  - Create an environment where industry invests and supplies cleaner technologies and SAF production
- A coordinated approach by government to derisks technologies, supply chains, and markets & reduce barriers to adoption
  - Data and analysis to support strong policies and support building of supply chains
  - Funding aircraft and engine technology innovation to support future technology
  - Investment that supports technology and SAF production infrastructure
- Industry action to deploy and adopt aviation decarbonization solutions

**- International Commitments**  
**- Inflation Reduction Act**

**- Climate Action Plan**  
**- SAF Grand Challenge Roadmap**  
**- Grant funding programs**

**Industry commitments**

# Inflation Reduction Act (IRA) – SAF Production Incentive support through 2027

## IRA Tax Credits

### SAF Tax Credit

§13203 : 2023-2024

- Achieves 50% lifecycle GHG reduction
- \$1.25 per gallon up to \$1.75 for additional lifecycle emissions reduction (\$0.01 for every 1% in GHG reduction)

### Clean Fuels Production Credit

§13704 : 2025-2027

- Lifecycle GHG <50kg CO<sub>2</sub>e/MMBTU (Jet Baseline = 94kg CO<sub>2</sub>e/MMBTU)
- Enhanced value for SAF up to \$1.75 for 100% reduction



# FAA Efforts to Advance Sustainable Aviation Fuels and Aircraft Technologies

- University center of excellence
- SAF testing & analysis
- SAF supply chain data & analysis
- Aircraft technology innovation



- Accelerating aircraft and engine technology maturation
- Partnership with industry



- Build SAF production, transportation, blending, and storage infrastructure
- Develop, demonstrate, and deploy low-emission aviation technology

# FAA CLEEN accelerates aircraft and engine tech maturation

- Technological innovation is essential
- One to one cost share with industry
- CLEEN established in 2010
- Announced CLEEN Phase III on Sept 9, 2021
- CLEEN Phase IV market survey released December 2022
- Summary of CLEEN Phase I and II accomplishments (10+ years) are available online

ICAO 2024 Regional Seminar on Environment



<http://www.faa.gov/go/cleem>

## CLEEN Phase III Technologies



# Inflation Reduction Act (IRA) – SAF and Technology Grant Program

## FAST Grant Program



New grant program under section 40007 of IRA

### Fueling Aviation's Sustainable Transition

Objective: *investments to accelerate the production and use of SAF and low emissions aviation technologies*

\$297 million (total) competitive grant program

- ❑ \$245 million for SAF projects to enable production, transport, blending, or storage of SAF
- ❑ \$46 million to develop or apply low-emission aviation technologies
- ❑ \$5.5 million for administration of the program

Awards announced **August 16, 2024**:

<https://www.faa.gov/newsroom/biden-harris-administration-announces-nearly-300-million-awards-sustainable-aviation-fuels>



The FAA award selections:

- 7 SAF Tier 1 projects - supply chain studies to identify infrastructure needs
- 15 SAF Tier 2 projects - infrastructure for SAF production, transportation, blending, and storage
- 13 Low-Emission Technology Category 1 projects - developing low-emission aviation technologies
- 1 Low-Emission Technology Category 2 project - developing test capabilities to advance low-emission aviation technologies

# FAST Grant Awards

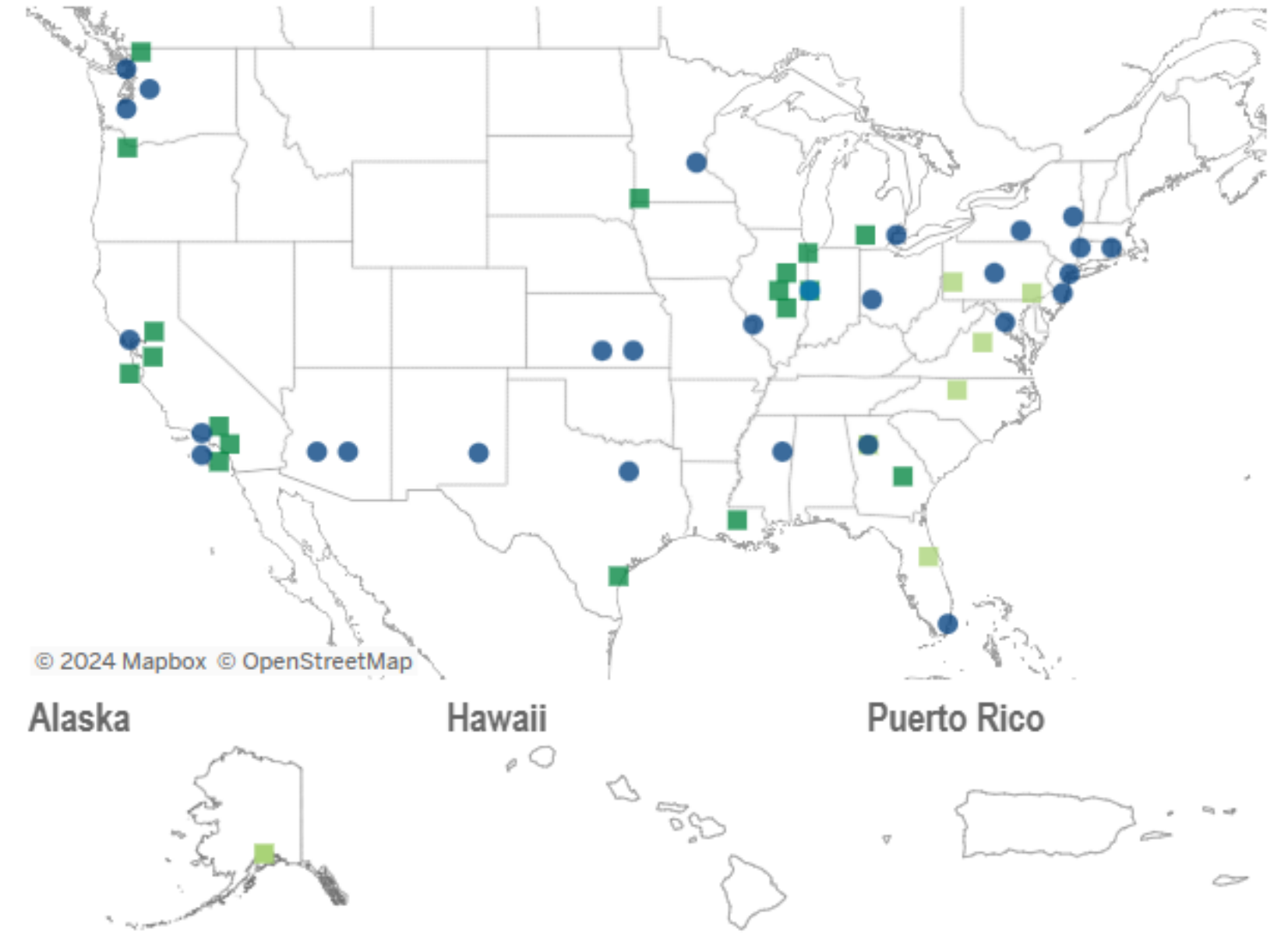
CAO 2024 Regional Seminar on Environment

## FAST Grant Awards

36 Projects

23 States

\$291M Awarded



Full list of awards available at:

<https://www.faa.gov/general/fueling-aviations-sustainable-transition-fast-grants>

# FAA ASCENT Center of Excellence

For 20 years, FAA Office of Environment and Energy has relied on university centers of excellence to:

- Provide knowledge to inform decision making on environment and energy
- Enable innovative solutions to cost-effectively mitigate aviation's environmental impacts
- Support student instruction on the environmental challenges facing aviation (674 students supported and counting).

## ASCENT Research Portfolio

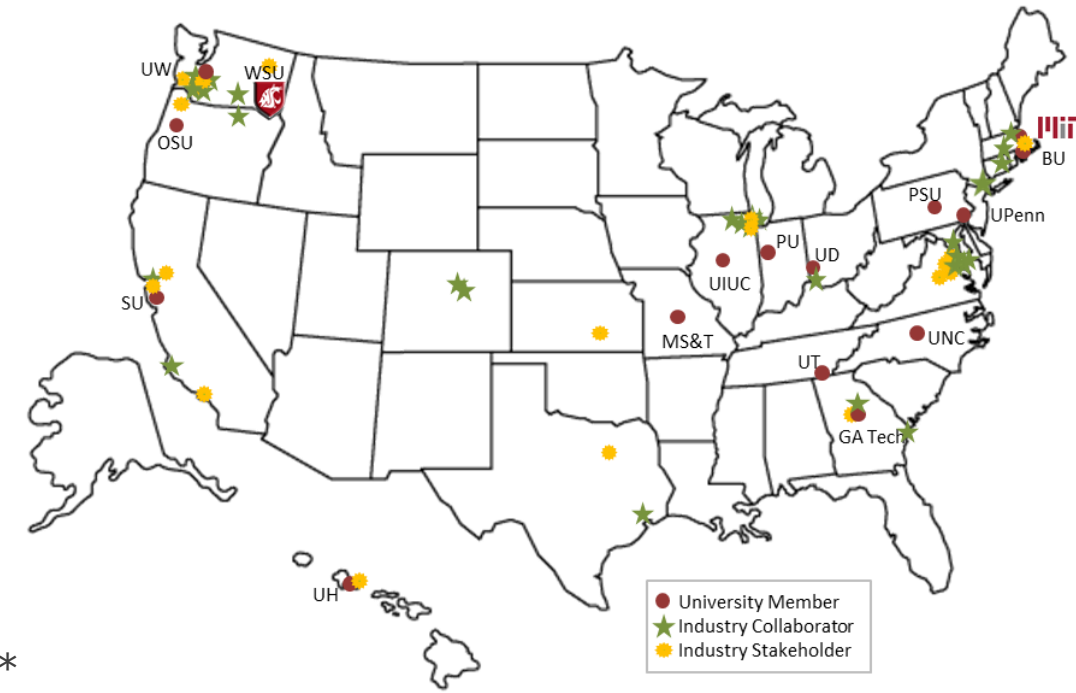
- 2013 - ASCENT established
- Portfolio covers SAF, Emissions, Noise, Operations, and Analytical Tools
- Currently overseeing a large increase in the portfolio

### Lead Universities:

- Washington State University (WSU)
- Massachusetts Institute of Technology (MIT)\*

### Core Universities:

- Boston University (BU)\*
- Georgia Institute of Technology (Ga Tech)\*
- Missouri University of Science and Technology (MS&T)\*
- Oregon State University (OSU)
- Pennsylvania State University (PSU)\*
- Purdue University (PU)\*
- Stanford University (SU)\*
- University of Dayton (UD)
- University of Hawaii (UH)
- University of Illinois at Urbana-Champaign (UIUC)\*
- University of North Carolina at Chapel Hill (UNC)\*
- University of Pennsylvania (UPenn)\*
- University of Tennessee (UT)
- University of Washington (UW)



### Multiple international partners

#### Advisory Committee (57 orgs)

- 5 airports
- 4 airlines
- 9 NGO/advocacy
- 8 aviation manufacturers
- 10 feedstock/fuel manufacturers
- 21 R&D, service to aviation sector

### ASCENT Support



2024 Regional Seminar on Environment

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# ASCENT Project 93 - Collaborative Research Network for Global SAF Supply Chain Development

In collaboration with the World Bank



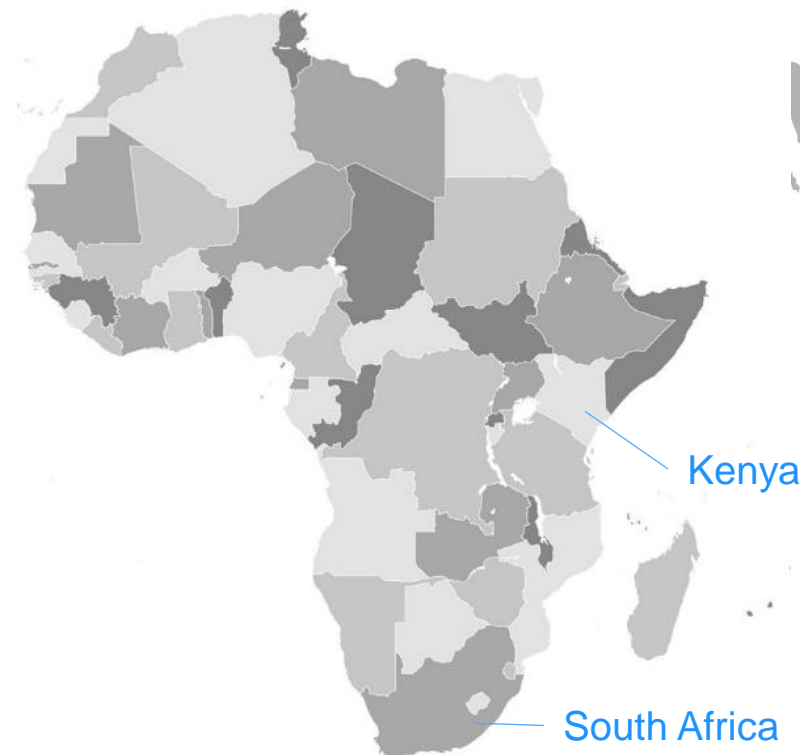
## Latin America and Caribbean



## Southeast Asia



## Sub-Saharan Africa



### Objectives:

- Feedstock availability
- Analyze SAF production pathways
- Infrastructure needs and assets
- Develop network of researchers in the regions
- Develop working groups

2024 Regional Seminar on Environment

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Washington  
State  
University

PIs: Manuel Garcia-Perez, Michael Wolcott  
Co-PIs: Lina Martinez, Kristin Brandt

Students:

▣ Colombia

- Marcela Valderrama

▣ Dominican Republic

- Raul Perez

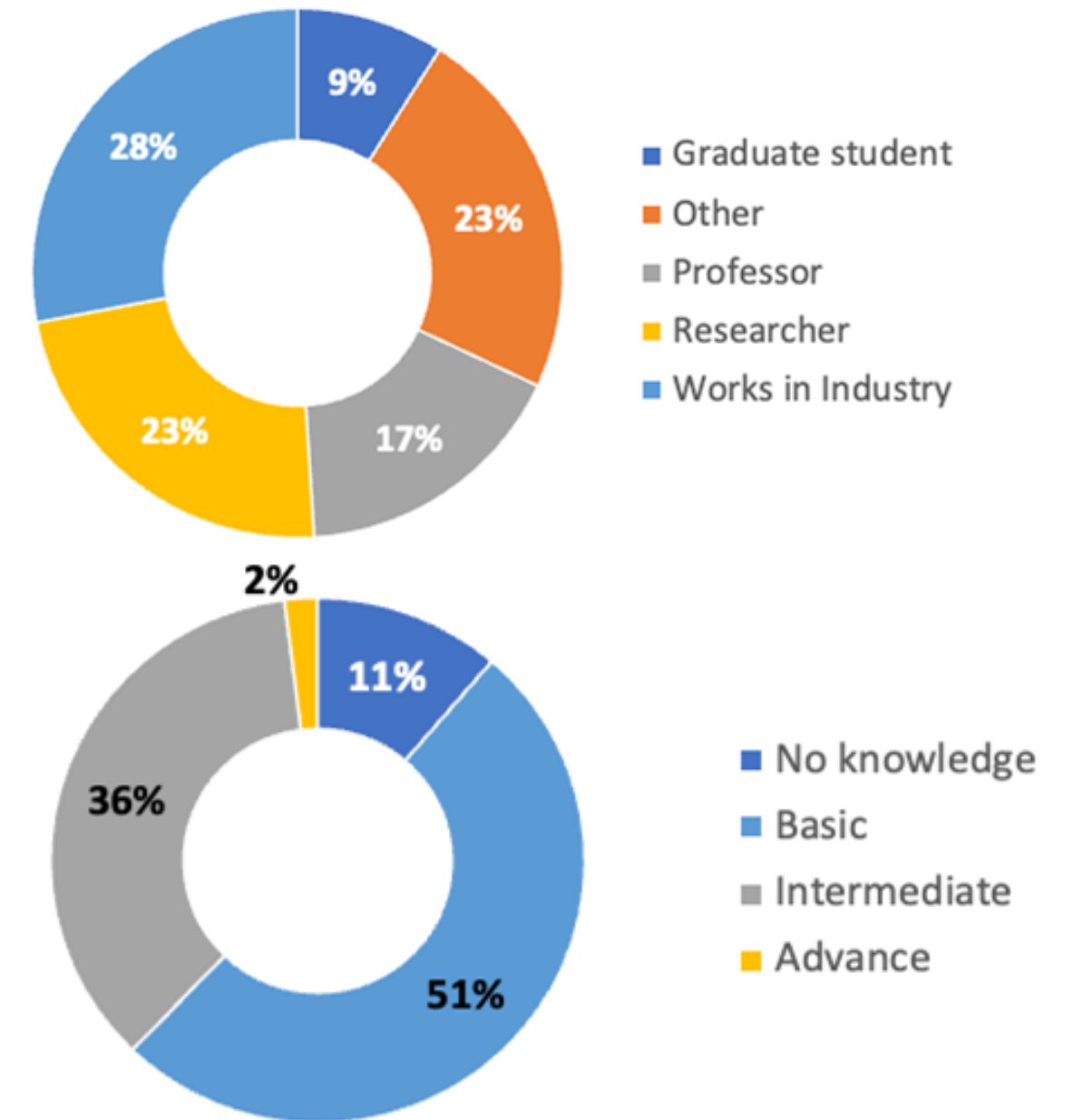
▣ Ecuador

- Paulina Echeverria
- Micaela Peralta

# ASCENT 03 Virtual Training Series

- Launched on November 2, 2023
- Concluding in December 2024
- 105 participants registered
- 21 lectures schedule
- Planning additional workshops with multilateral organizations and interested partners
- WSU will provide a certificate for participants who have attended at least 75% of the lectures

53 initial survey responses



# Thank You



Nathan Brown

Senior Representative for South America

U.S. Federal Aviation Administration

[Nathan.Brown@faa.gov](mailto:Nathan.Brown@faa.gov)

# Thank You



# 2024 ICAO REGIONAL SEMINAR ON ENVIRONMENT

In collaboration with



NACC & SAM Regions

20 to 21, August 2024

Asunción, Paraguay



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ACT SAF

CORSIA



2024 ICAO REGIONAL SEMINAR ON ENVIRONMENT

In collaboration with



NACC & SAM Regions

20 to 21, August 2024

Asunción, Paraguay



2050



CORSIA

# Public funding for SAF: IATA assessment

1

Industry and governments global net zero commitments

2

Technology solutions to reach net zero

3

Importance of public funding

4

Mitigating SAF financing risks

5

Key public funding available for SAF

6

Conclusions



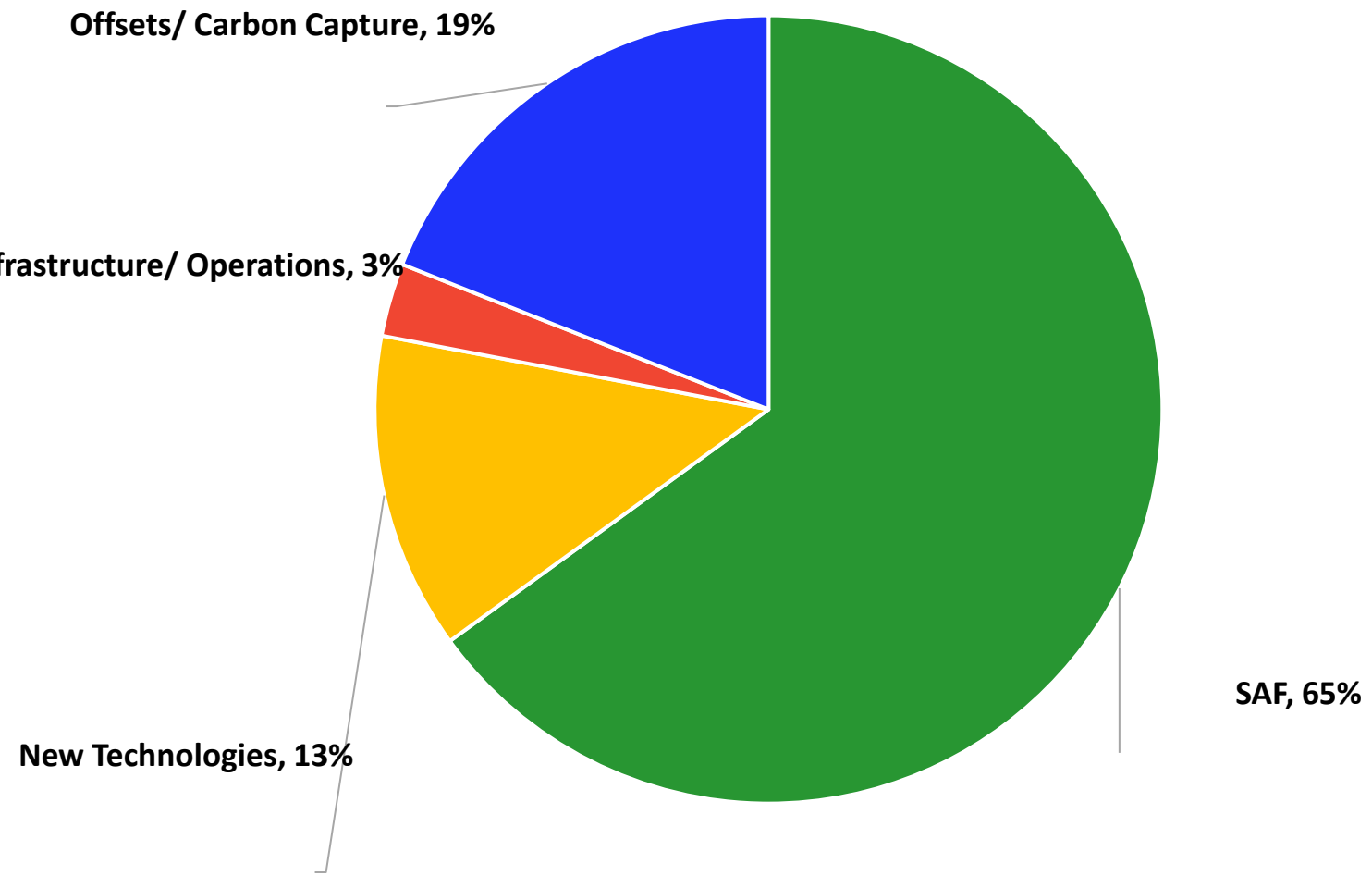
# From Industry Commitment to UN Approval



The confirmation of the UN aviation body, ICAO, aligning themselves with the Long-Term Aspirational Goal was a landmark agreement for the aviation industry. In attaining this approval from over 190+ member state countries, it represented:

- A firm global commitment from governments toward aviation's Net Zero 2050 goal
- A clear recognition and acceptance that SAF would be the key driver of achieving the success of the goal

# Technology Solutions to reach Net Zero



**SAF responsible for the greatest amount of CO<sub>2</sub> reductions by 2050 (65%)**

Year	2019	2020	2021	2022	2023	2024 f
Estimated SAF Output (Mt)	<0.02	0.05	0.08	0.24	0.5	1.5**
Global Jet Fuel (Mt)*	288	157	182	254	271	285
SAF % of Global Jet Fuel	<0.01%	0.03%	0.04%	0.1%	0.18%	0.5%

**1,000x increase in production is needed by 2050 (500 Mt)**

# Public funding important for early-stage tech

Particularly crucial in R&D stage



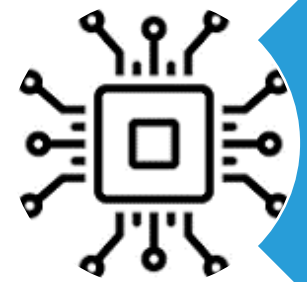
Internet



GPS



Human Genome Project (HGP)



Semiconductors



Note: Governments' crucial role also in the development of new energy markets is a main takeaway of IATA's publication [A reflection on policies used to support the creation of new renewable energy markets.](#)

- **200k**

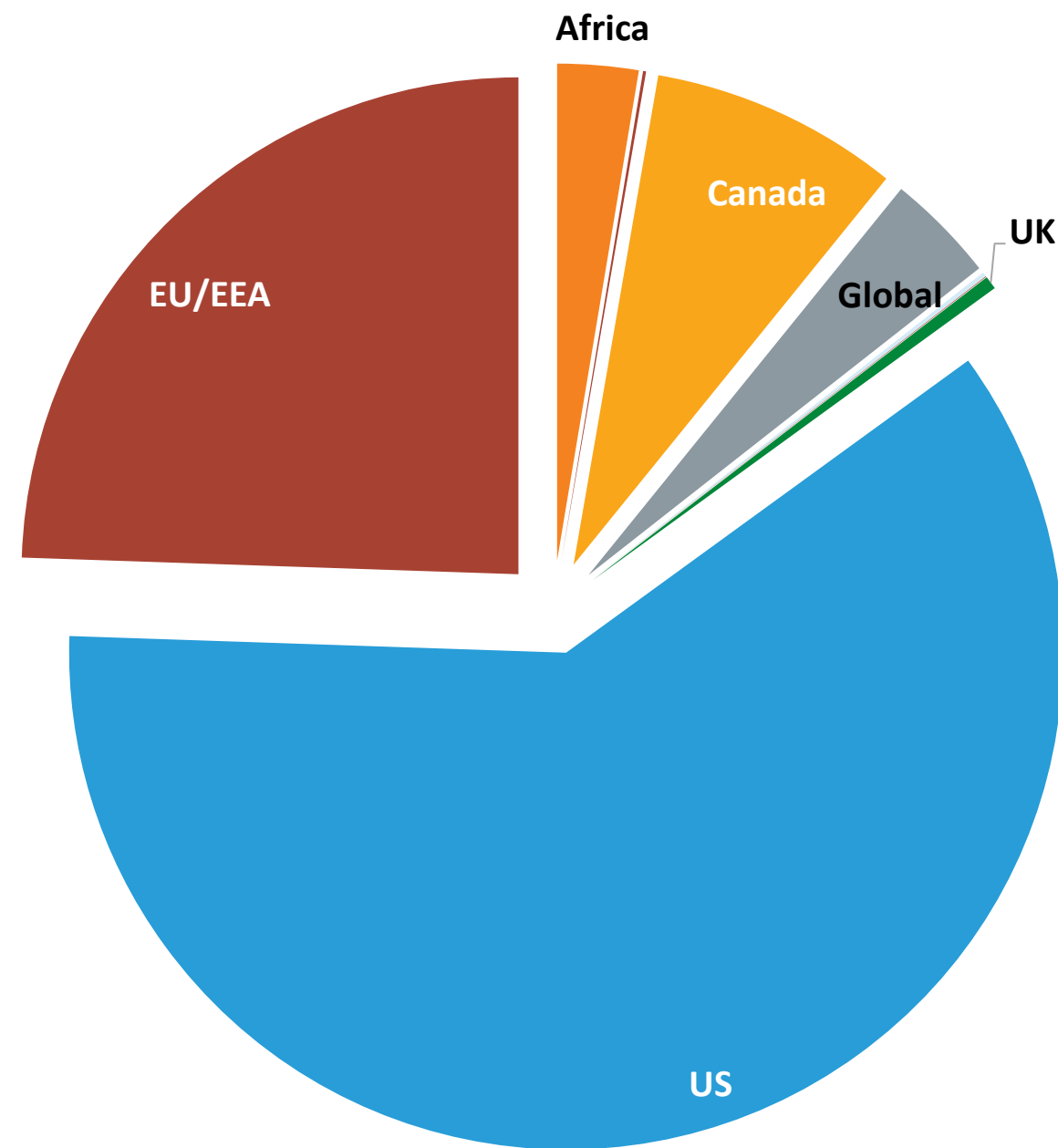
- Additional jobs in
  - EU

Public funding of SAF supports broader sustainability benefits

- Economic growth and job creation
- Energy resilience and security
- Recultivation of degraded land

# Key public funding available for advanced biofuels

## IATA analysis preliminary results



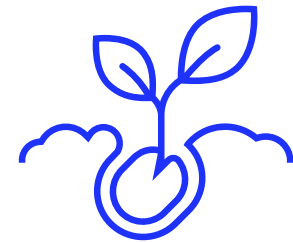
- IATA analysis' results on key public funding available for advanced biofuels, including SAF, will be released by end of 2024 on [iata.org](http://iata.org)

# Need for more targeted public funding for SAF

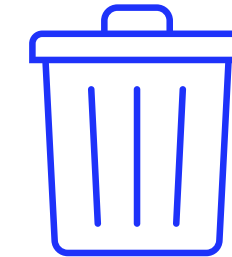
## IATA analysis preliminary results



**More public support  
needed for R&D  
stages**



**Funding essential for  
first-of-a-kind (FOAK)  
projects**



**Support to  
improve supply  
chains and  
feedstock**

## Conclusions

1. Public funding support is essential for **early-stage technologies**.
2. Currently, majority of public funding for advanced biofuels, including SAF, is available in **North America and EU/EEA**.
3. More public funding for SAF is needed **in emerging markets**, and particularly targeted towards R&D stages, FOAK projects and **improved supply chains** and SAF feedstock development.

# Thank you



## **Pedro de la Fuente**

Senior Manager External Affairs & Sustainability, IATA Americas

[delafuep@iata.org](mailto:delafuep@iata.org)



# Thank You



# 2024 ICAO REGIONAL SEMINAR ON ENVIRONMENT

In collaboration with



NACC & SAM Regions

20 to 21, August 2024

Asunción, Paraguay



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ACT SAF

CORSIA



# Descarbonización de la industria aérea en América Latina

Seminario Regional OACI NAM/CAR/SAM sobre Medio Ambiente 2024

Felipe Andrés Gómez - Director de sostenibilidad y relaciones institucionales

Agosto, 21 de 2024



ICAO

2024 Regional Seminar on Environment

# 2024 ICAO REGIONAL SEMINAR ON ENVIRONMENT

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Sostenibilidad económica,  
ambiental y social en América  
Latina

Focos para la inversión en  
América Latina (SAF, LCAF)



# Sostenibilidad para la aviación en América Latina

## Ampliar acceso y conectividad


- **0.6 viajes anuales per cápita (LAC).**
- **Baja capacidad adquisitiva. Alta sensibilidad al precio.**
- **Ausencia de modos de transporte alternativos a la aviación.**
- **Altos niveles tributarios, alto costo de combustible, bajo desarrollo de la infraestructura aeronáutica.**
- **Intensa dinámica competitiva; ningún subsidio estatal a la industria.**



- Modelo de negocio.
- 32.2 millones de pasajeros en 2023.
- 80 destinos domésticos e internacionales.
- Diversas rutas domésticas (COL) a zonas remotas.

# Sostenibilidad para la aviación en América Latina

## Mitigar el impacto ambiental

- **Alto costo de combustible en toda la región.**
  - **Infraestructura y procedimientos aeronáuticos limitados.**
  - **Nula o incipiente inversión en SAF / LCAF**
- Simplificación de la flota
  - 20% menos emisiones totales de CO<sub>2</sub> en 2023 Vs. 2019; 26 % menos emisiones de CO<sub>2</sub> por pasajero transportado Vs. 2019
  -  Llegada de más de 100 aviones A320 NEO en los próximos años
  - 4.517.416 toneladas de CO<sub>2</sub> compensadas entre 2017 y 2023
  - Calificación B en el Carbon Disclosure Project (CDP)

# Sostenibilidad para la aviación en América Latina

## Crear impacto social en comunidades vulnerables

- **Altos niveles de pobreza e inequidad en toda la región.**
- **Estados incapaces de atender necesidades básicas de la población.**
- **Acceso limitado o nulo a servicios básicos por parte una porción de la población.**

- 22 aliados sociales en temas de salud y ambientales



- 14.000 beneficiados en 2023. Más de 20.000 en 2024 (proyectado).
- Impacto en Colombia, Ecuador, El Salvador.

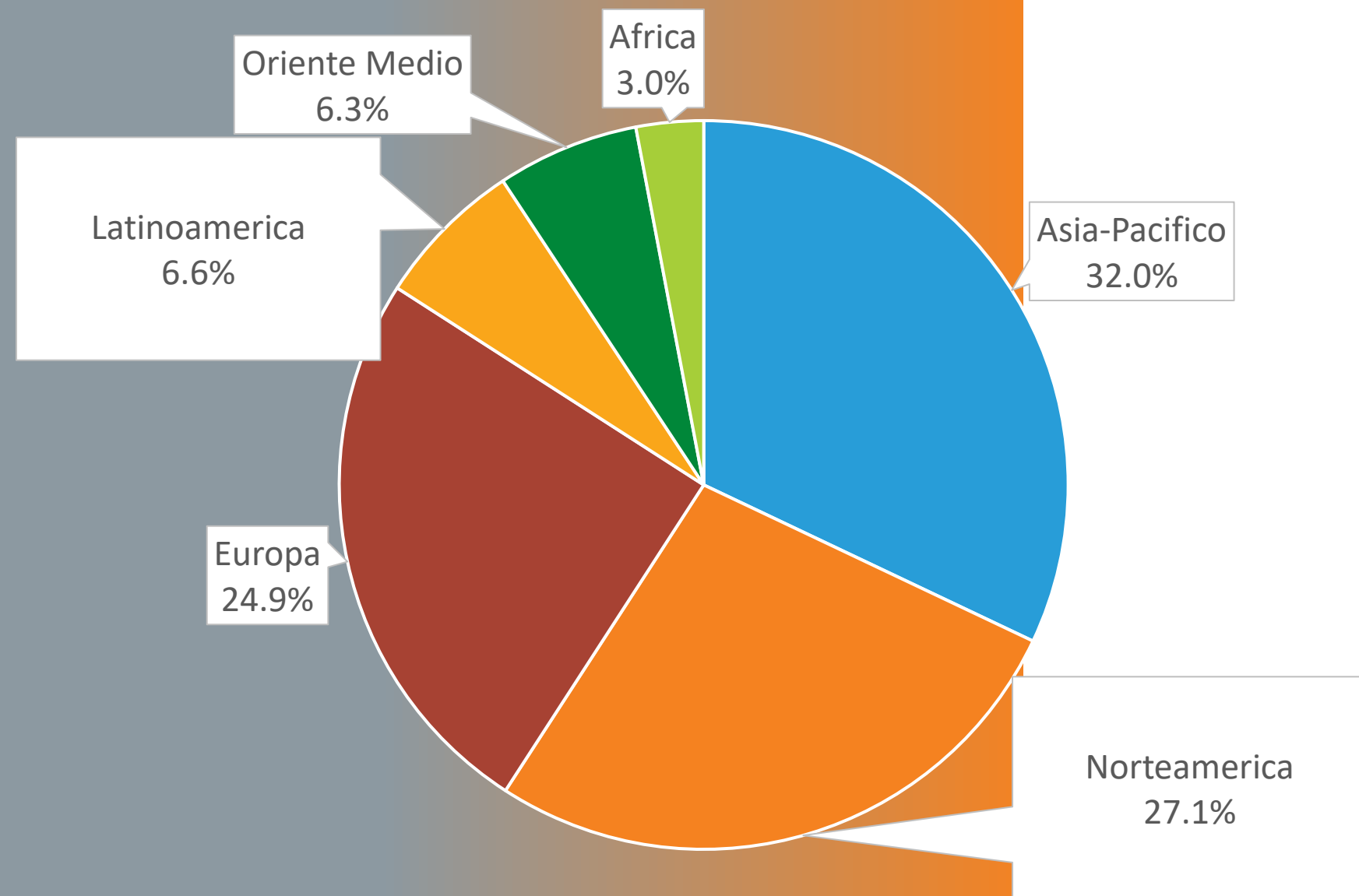


Descarbonización justa,  
realista y colaborativa



# DESCARBONIZACIÓN JUSTA, REALISTA Y COLABORATIVA

Emisiones Acumuladas de CO2 por región de domicilio (2013-2023)



- La huella ambiental de la aviación en LAC no es comparable a la de otras regiones desarrolladas.
- Protección al acceso al servicio aéreo en la región para impulsar el desarrollo, tal como lo han hecho otras regiones.
- Foco en que LAC sea productor de SAF para el mundo.
- Inversión y financiación internacional enfocadas en creación de capacidades públicas y privadas para producción de SAF.

# FACTORES DETERMINANTES PARA EL SAF EN AMÉRICA LATINA

El costo de los tiquetes no puede incrementar.

NO esquemas de mandatos de uso de SAF.

América Latina productora/exportadora de SAF.

No limitar materias primas y tecnología disponibles en la región.

Habilitación de esquemas book & claim.

Construcción de capacidades regionales, no solo nacionales.



Focos para la Inversión  
en América Latina (SAF,  
LCAF)



# Focos para la inversión

- Desarrollo e incentivos para las capacidades industriales de producción de SAF.
- Certificación de materias primas y tecnologías existentes en la región.
- Fortalecimiento de capacidades públicas y privadas para regulación y desarrollo de la industria del SAF.
- Estudios y caracterización de potenciales en SAF en la región.
- Creación de capacidades regionales para la producción de SAF.
- Desarrollo y viabilidad book & claim.

**avianca**

el cielo es de todos



# Thank You



AGOSTO 2024



# Camino a la descarbonización de la industria

Porcentaje de  
emisiones de CO<sub>2</sub>  
globales al 2030

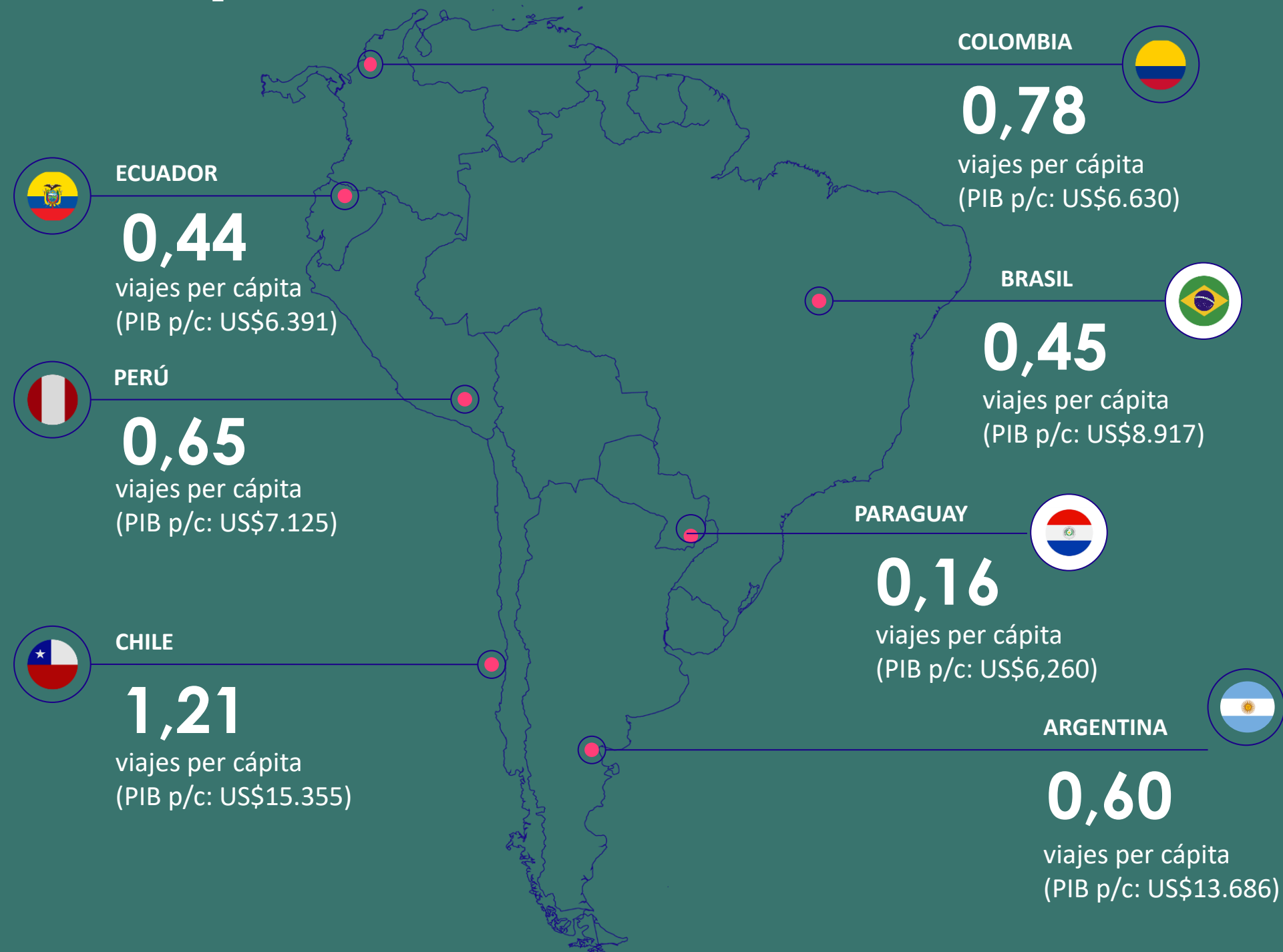
3,6%  
(2030)

2,5%  
(2024)

Percepción de la  
contribución de la aviación  
al cambio climático

81%  
DE LAS PERSONAS  
PIENSAN QUE ES  
MAYOR AL 6%

# La región tiene potencial para que más pasajeros accedan al transporte aéreo



	Viajes per cápita	PIB per cápita
EEUU (1)	2,5	US\$81,695
China (2)	0,4	US\$12,614
Reino Unido (3)	3,6	US\$48,866
España (4)	4,5	US\$32,677
India (5)	0,1	US\$2,484

# Financiamiento de la descarbonización

**US\$ 5.3**  
trillones  
(2030-2050)



# Cambio climático



El objetivo de LATAM

Avanzar en la hoja de ruta hacia Net Zero de manera sostenible con el entorno, las comunidades y el negocio.

¿Cómo lo haremos?

1. Nuevas tecnologías



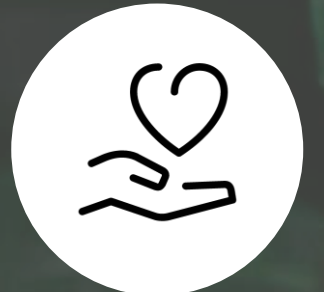
2. Combustibles alternativos (SAF)



3. Eficiencias operacionales



4. Compensación



# 1. Eficiencias

Desde 2010

Mayor eficiencia **6,3%**

Emisiones evitadas **4,8 MM**  
de tons

*La industria necesita mayor inversión*

Jet Fuel - **45 M**  
Ground Fuel **tons**

Diesel - **13 M**  
Ground Handling **tons**

## 2. Tecnología



**Renovación flota (2024-30):  
+200 aeronaves de última generación**



**Aeroshark en B777:  
1% mayor eficiencia**

### **La industria necesita:**

- Mejores condiciones de financiamiento
- Tecnología en aeropuertos para mejores predicciones climatológicas e información de congestión

# 3. SAF

2023

~72 mil  
gal SAF

**633** tons  
de CO<sub>2</sub> evitadas

*La industria  
necesita*

**políticas  
públicas adecuadas**

Primer Vuelo Internacional con SAF  
LATAM - Zaragoza, Marzo 2023

# 4. Soluciones basadas en la naturaleza

AL 2030

**11.3 MM**

ton CO<sub>2</sub>

---

**575 mil ha**

(3,8 x São Paulo)

# Potencialidad de la región

## Oportunidades

El principal **potencial en la región** es soluciones basadas en la naturaleza (SBN).

**La región** podría ser uno de los principales productores de créditos de carbono en CORSIA<sup>2</sup>.

- >70% de los créditos en Brasil son **REDD+**
- >60% de los créditos en Colombia son **REDD+**

**Tendría un impacto real:** en términos de las emisiones de GEI, la deforestación es responsable del:

- 48% en Brasil
- 47% en Perú
- 36% en Colombia

## Retos

### Escasez de créditos de carbono:

Demanda de los 126 países actualmente en CORSIA<sup>1</sup>:

- 2024 a 2026: 64-162 MM créditos
- 2027 a 2035: 1200-2000 MM créditos<sup>1</sup>

Actualmente existen 4.6MM de créditos disponibles

### Sudamérica está excluido:

Limitación a proyectos REDD+, excluyendo una gran parte del mercado de carbono de la región.



**6 de 10 PAÍSES** con mayor biodiversidad del planeta

**1/3 del AGUA DULCE** del mundo



**1/4 de BOSQUES y TIERRAS cultivables** del mundo

Disponibilidad de **recursos y materias primas sostenibles**

\* en relación al planeta

1 IATA, 2023

2. Informe sobre el estado actual del mercado Colombiano de Carbono. ASOCRABONO y Minam

AGOSTO 2024



# Camino a la descarbonización de la industria

# Thank You



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CORSIA





SUSTAINABLE  
AEROSPACE  
TOGETHER

# Needs and opportunities in financing aviation decarbonization projects

Otavio Cavalett

Global Enterprise Sustainability | The Boeing Company



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1 SAF SCALE UNLOCKS

3 United Sustainability Fund

5 FinVest Hub

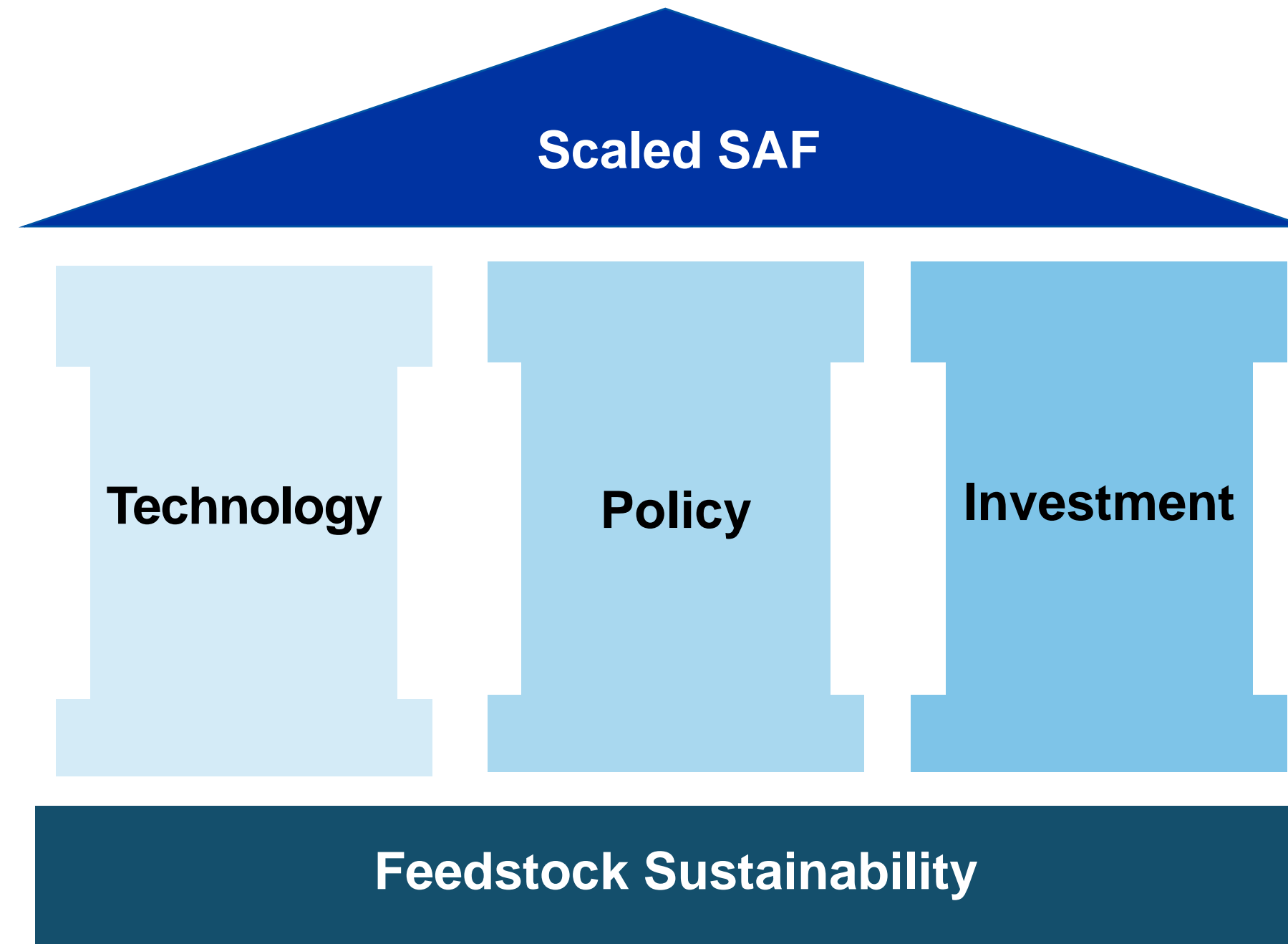
7 2030 – 5% CO2 reduction from SAF and LCAF

2 Costs of LTAG

4 Clear Sky / Firefly

6 SAF Maps project

8 Common views on SAF financing





## Costs and Investments Associated with Long-term Aspirational Goal Integrated Scenarios

By Philippe A. Bonnefoy (USA)<sup>1</sup>

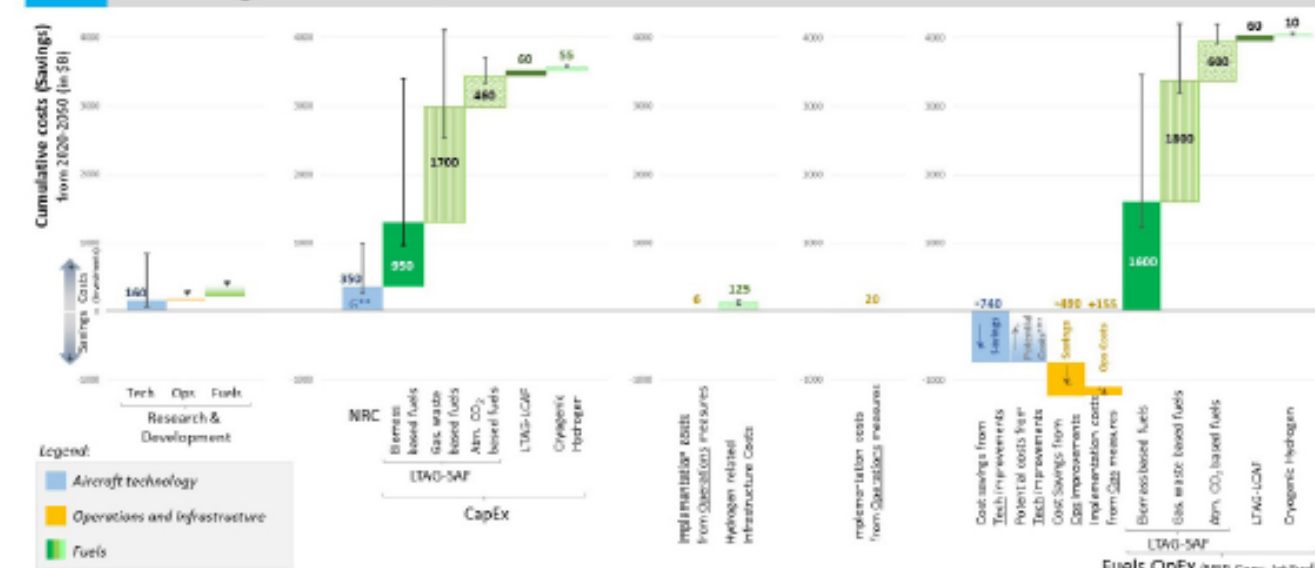
### IS1 LTAG Integrated Scenario 1



### IS2 LTAG Integrated Scenario 2



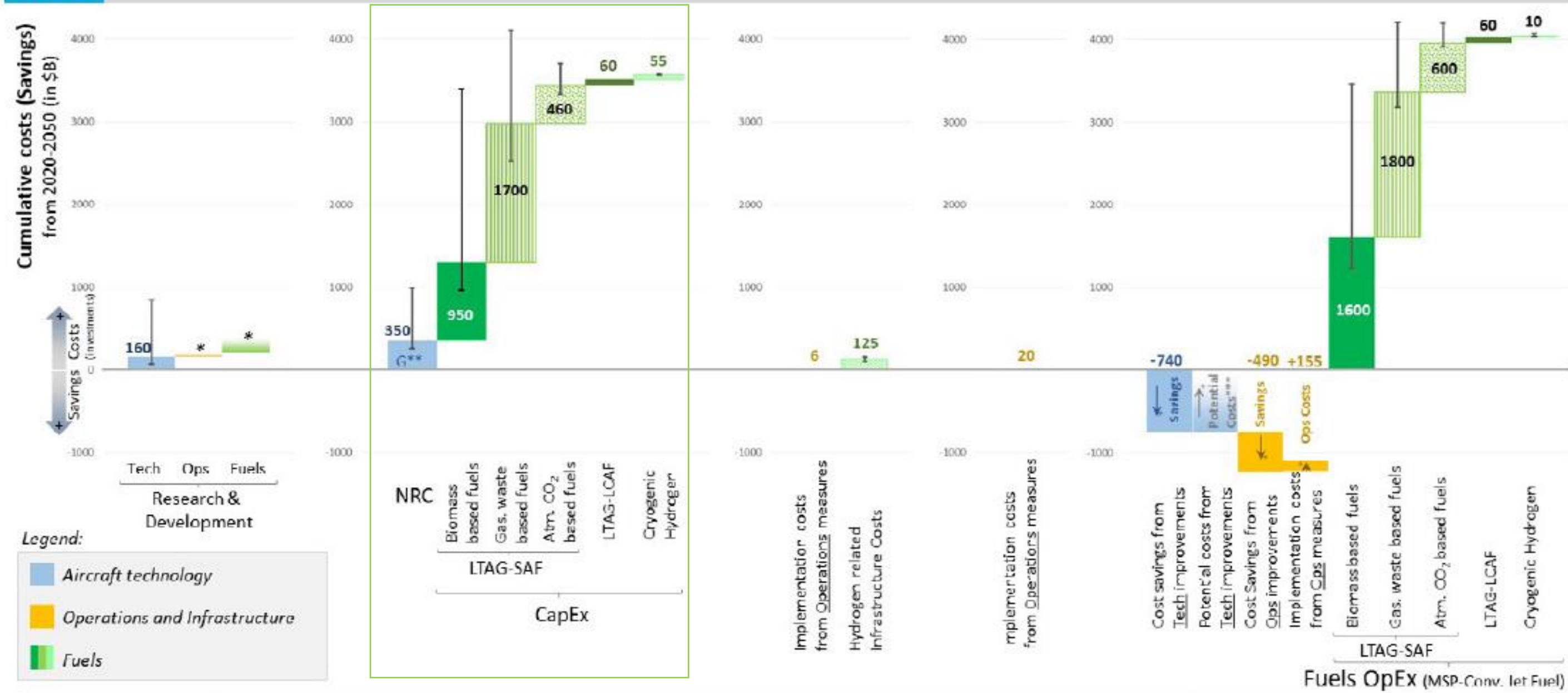
### IS3 LTAG Integrated Scenario 3



\* Not quantified but expected to be necessary to support future implementation of operations measures and development of future fuels technologies.  
 \*\* NRC towards aircraft development for global (domestic + international) aviation.  
 \*\*\* Potential costs (e.g., from increased aircraft price after technology improvements) potentially reducing savings from fuel efficiency improvements.

# Costs of LTAG

## IS3 LTAG Integrated Scenario 3



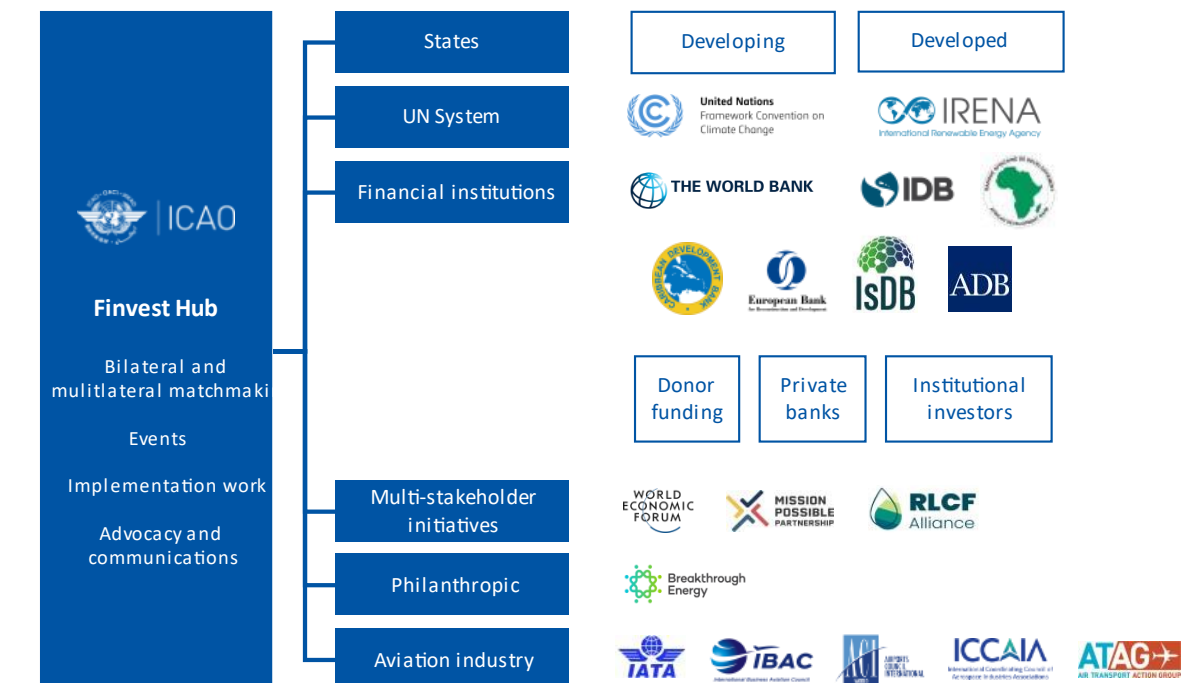
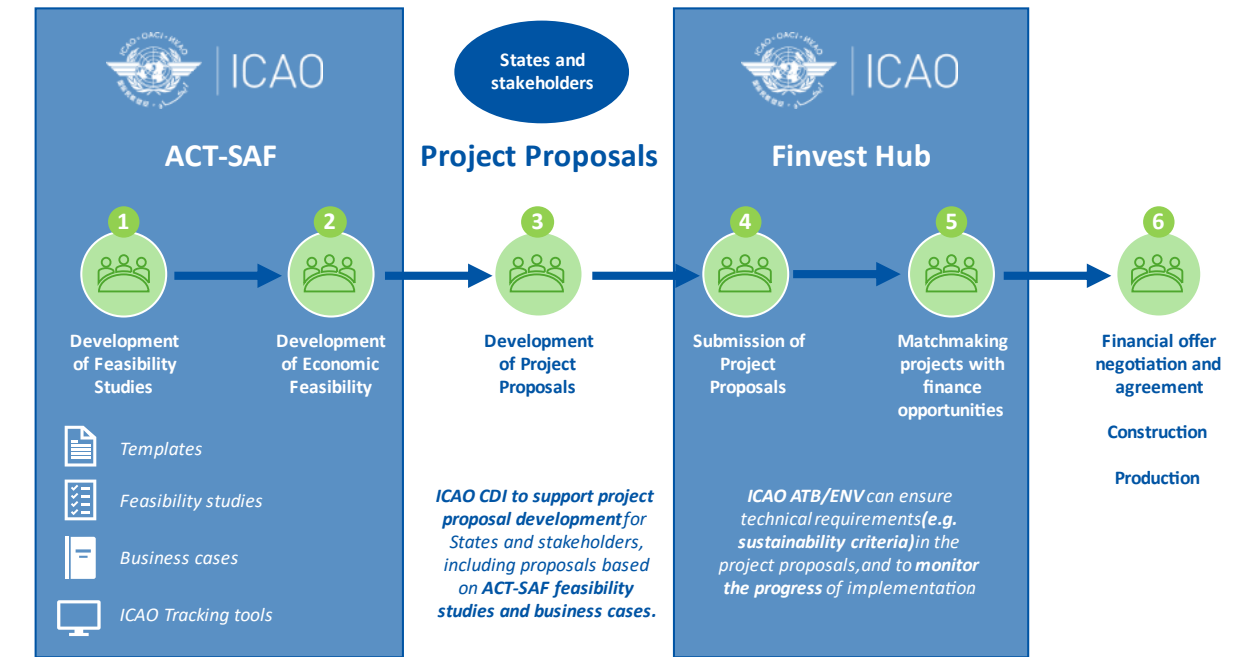
- Boeing have invested in **this United Airlines Ventures Sustainable Flight Fund (SFF)**
- The initial round of funding, estimated to be between \$100 and \$150 million, will include contributions from inaugural corporate partners United, Boeing, Air Canada, Honeywell, JPMorgan Chase and GE.
- Through this collaboration with United and its partners, Boeing is investing in **SAF research, production and technology.**
- This is a first-of-its-kind investment fund designed to support start-ups and companies focused on decarbonizing air travel.

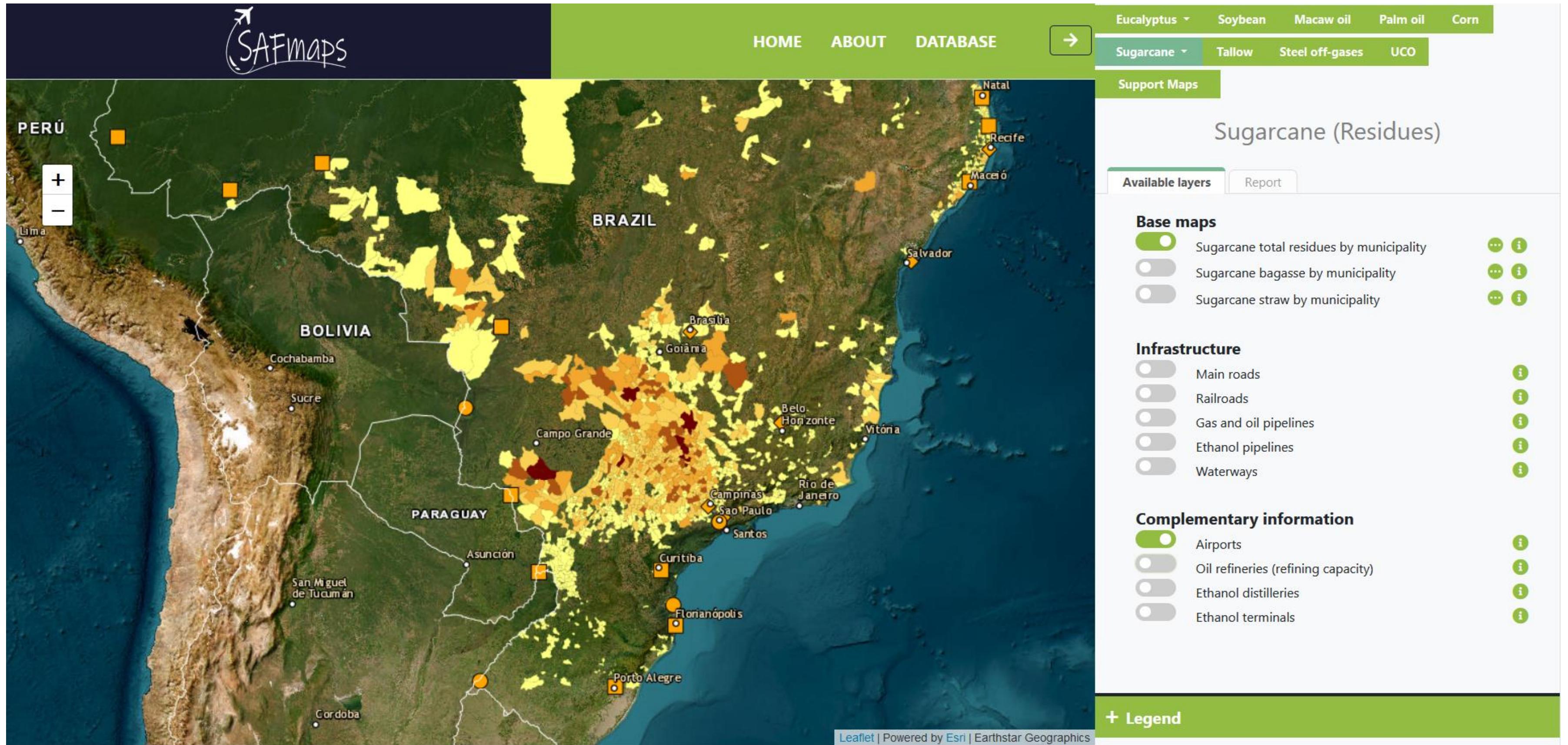


- Boeing announced a partnership with **Clear Sky**, an investment company dedicated to aviation sustainability, to accelerate sustainability solutions for aviation.
- As an initial project, the companies will help in testing and advancing **Firefly Green Fuels'** cutting-edge technology to increase SAF production in the UK.
- **Boeing and Clear Sky** are embarking on an **international investment partnership** focused on sustainability solutions that span aviation and adjacent industries such as chemicals and materials.
- Areas of focus include SAF, alternative propulsion, carbon removal and advanced materials and recycling.



- The ICAO **Finvest Hub** aims to facilitate access to public and private investment capacities and funding from financial institutions, with a **focus on developing countries and States** with particular needs, for projects that contribute to the decarbonization of international aviation.
- Special attention on least developed countries.
- Boeing is supportive of the concept of FinVest as it potentially can help unlock SAF project funding that would otherwise get stuck.
- For example we have supported **SAF roadmaps** around the world to identify potentials in feedstock supply and projects. These will need the finance to help implement (FinVest as an example).





# 2030 – 5% CO<sub>2</sub> reduction from SAF and LCAF

## What do the numbers mean?

Assume:  
~360Mt jet fuel  
demand in 2030

**24.0 Mt**  
SAF/LCAF delivered in 2030  
(WAERF~75%)

**~6.7%**  
of projected global jet fuel

ICAO forecast for production:  
• **16.9 Mt in 2030 (high+)**  
*Additional 91 announcements since January 2023. Aggregate totaling 12Mt without a success probability applied.*

Demand for production from policy measures\*:  
• **~ 20 Mt in 2030**  
*\*US Grand Challenge, ReFuel EU, UK, China, Turkey, etc  
Implementation risk exists with some policies.*

Estimated cost:  
• **~\$20 bn** capital for plant construction

Reasonableness / pathway to NZE 2050

Total facilities required (using ICAO rule of thumb assumptions)  
• **36 @ ~800,000 tonne output per annum by 2030**

Demand from voluntary initiatives  
• **4.0(?) Mt in 2030**  
*\*FMC, Scope 3 initiatives and other?*

SAF mix assumption:  
- HEFA: 84%  
- AtJ: 7%  
- FT: 7%  
- PtL: 2%  
  
- **\$276m / month**

- Some airlines and States have committed to 5%-10%, while several others are starting from 0%
- **Is it the right mix of realism and ambition?**

# Common views on SAF financing

- We will need a huge amount of financial resources .
- Many innovation funds and venture capital firms are looking to invest in breakthrough technologies related to sustainable energy and aviation.
- Lack of financial resources isn't the main issue for SAF deployment.
- Producing SAF needs to make sense from the investment side. Price certainty and duration of offtakes is a key factor. Need a stronger signal from demand (regulation?)
- Larger uncertainty in the feedstock cost. Will it be considered sustainable by regulations now and in the future?
- Financing institutions need better understanding of technology and appetite for this type of risk, specially if you compare with risks in other industries.
- We will need more predictable, replicable, and scalable projects.
- Risk sharing mechanisms among the value chain.

# Thank You



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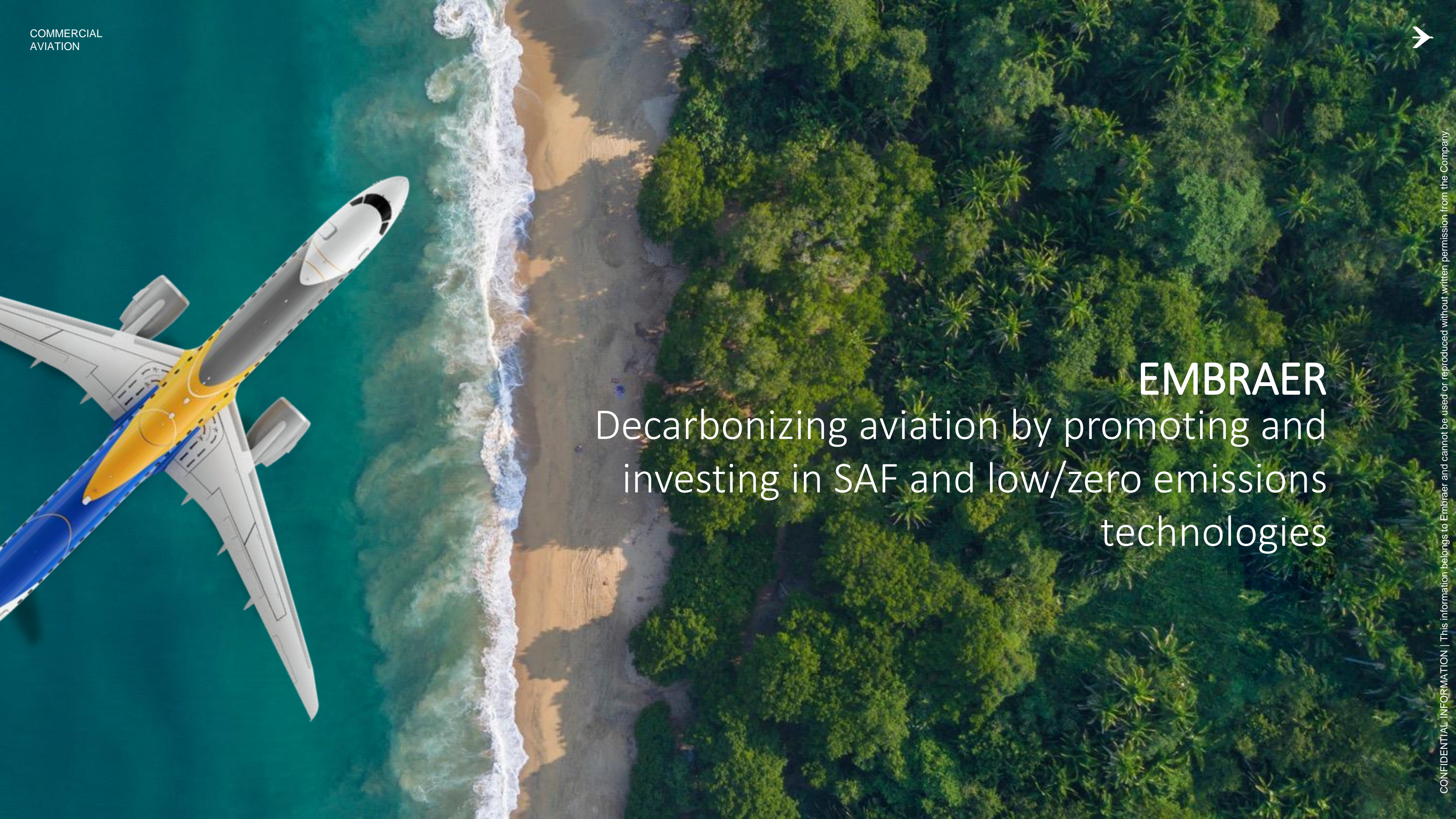
ENVIRONMENT



ACT SAF

CORSIA





**EMBRAER**  
Decarbonizing aviation by promoting and  
investing in SAF and low/zero emissions  
technologies

# Better access to financing for aviation decarbonization projects

**01** OFFTAKE AGREEMENTS

**02** POLICY SECURITY

**03** CAPEX BALANCE





# EMBRAER'S ENVIRONMENTAL COMMITMENTS



**Scope 1**  
Direct Emissions



**Scope 2**  
Indirect Emissions



**Scope 3**  
Product Lifecycle Emissions

**Carbon Neutral Growth** from 2022, and **Carbon Neutral** from 2040

**Solutions to net zero emissions** in aviation by 2050

Regular usage of **SAF** from 2021 at Embraer's units

**100% energy from Renewable Sources** by 2030

**Aircraft 100% compatible with SAF** by 2030

Reaching **25% of SAF** in our operations by 2040

**Brazil facilities - 100% energy from Renewable Sources** by 2024

**SAF advocacy** and collaboration to expand production

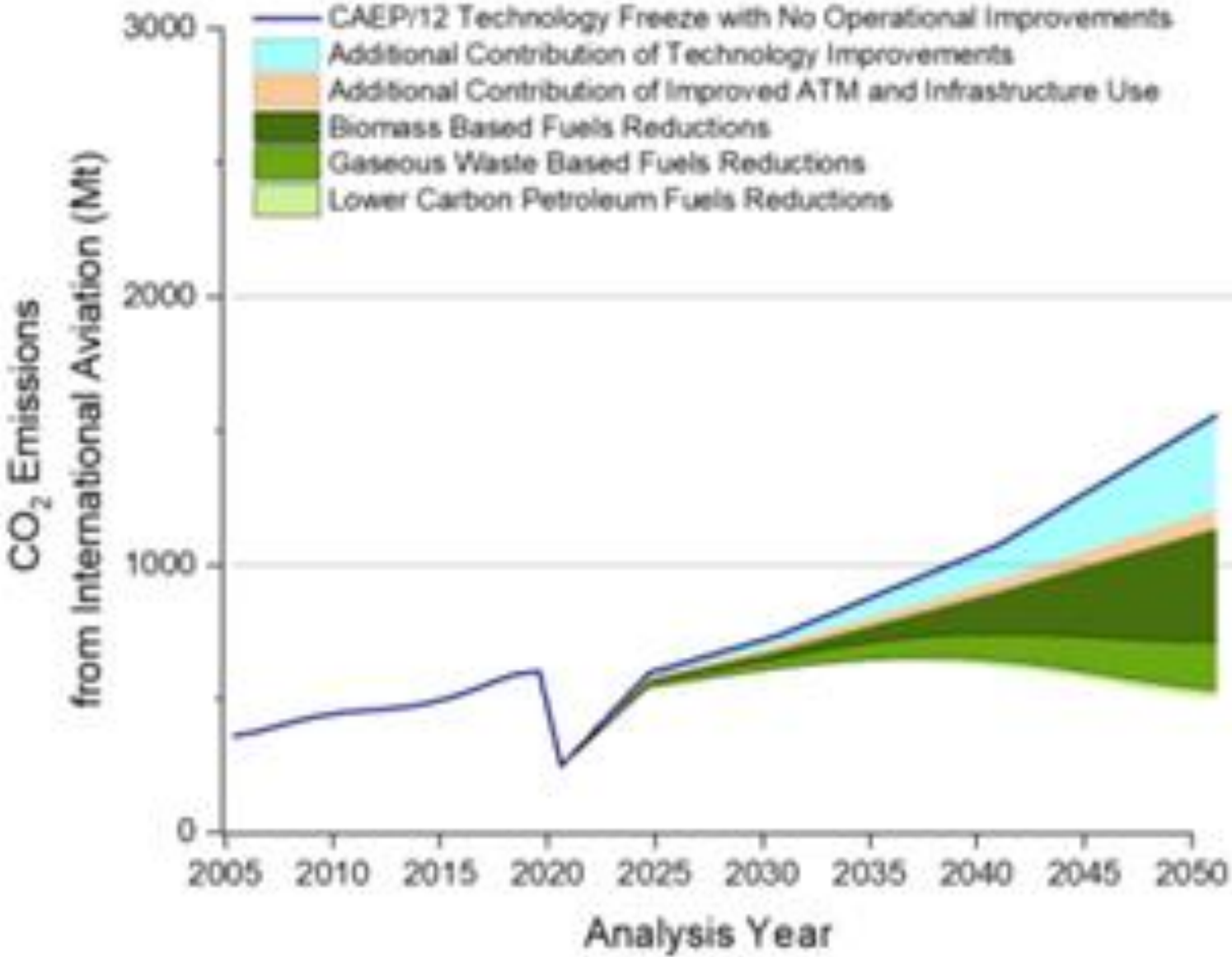
Keep improving the efficiency of our current portfolio

**New Green Technologies** for future products





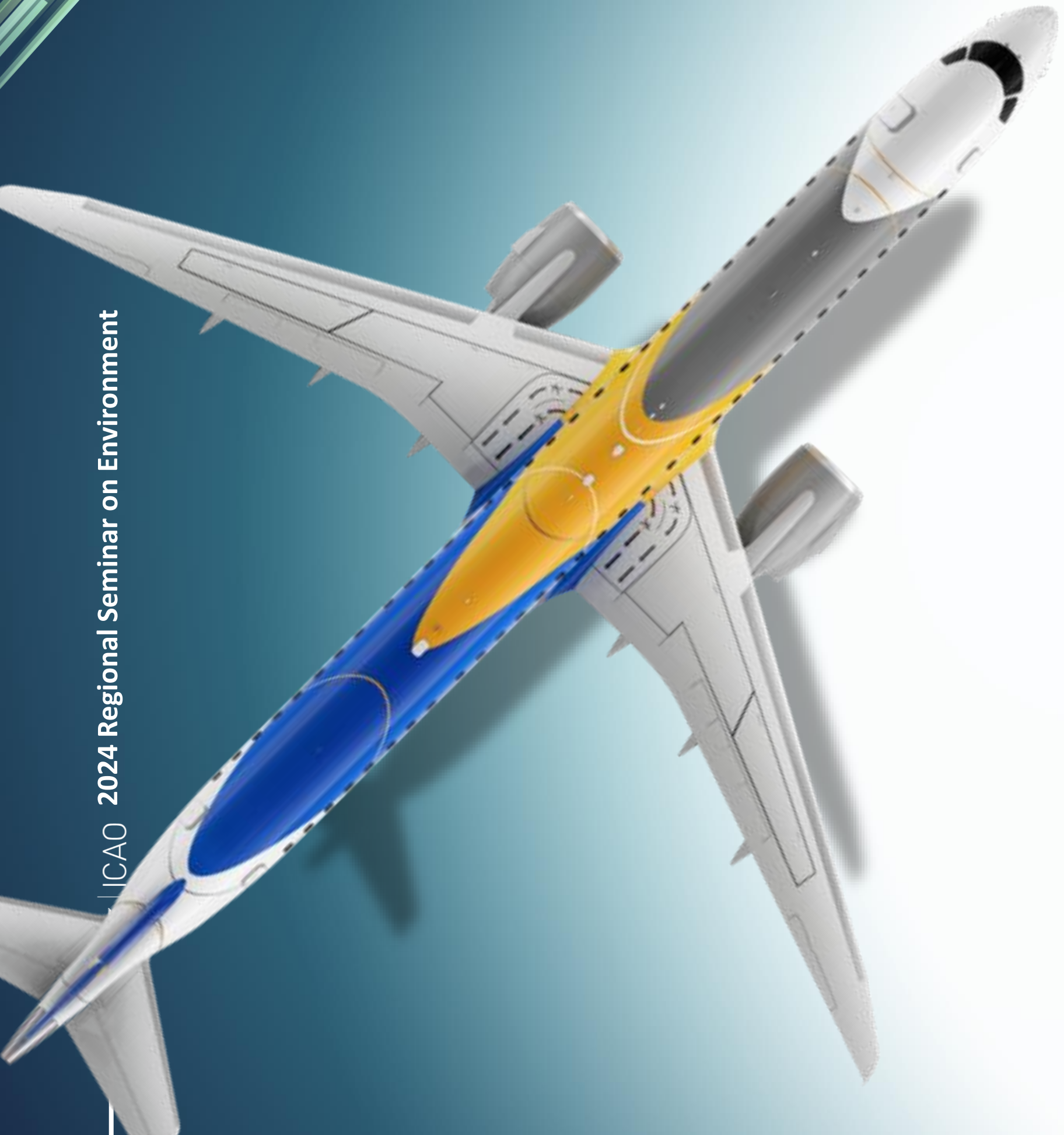
# Trends in Aircraft Fuel Burn and CO<sub>2</sub> Emissions



Note: Results were modeled for 2005, 2006, 2010, 2015 (Prior CAEP work cycles); 2018, 2019, 2020, 2024, 2030, 2040, and 2050 (CAEP/12)

**Figure 3. CO<sub>2</sub> Emissions from International Aviation, 2005 to 2050, Including Alternative Fuels Net Life-Cycle Emissions Reductions.**

Source: ICAO



## LOWER FUEL BURN, LESS EMISSIONS

According to ICAO and ATAG, **Fleet Renewal** can reduce emissions by an average of **20%** in a short timeframe

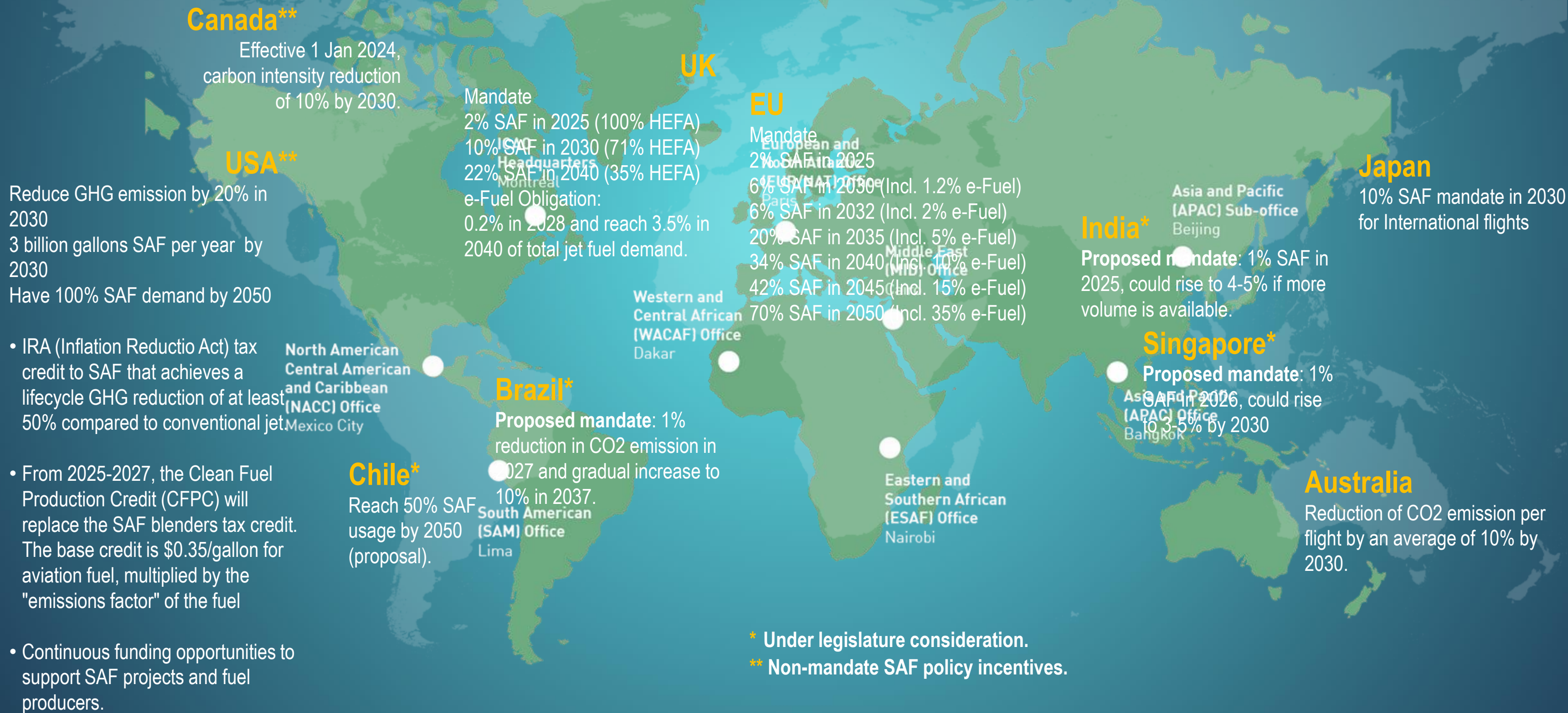
Up to **-25%**

**LOWER FUEL BURN PER SEAT**  
E195-E2 vs. E195-E1



# Thank You

## HARMONIZED AND FAIR CARBON EMISSION POLICIES ARE NEEDED FOR SECURING MORE AND CHEAPER FINANCING



- IRA (Inflation Reduction Act) tax credit to SAF that achieves a lifecycle GHG reduction of at least 50% compared to conventional jet.
- From 2025-2027, the Clean Fuel Production Credit (CFPC) will replace the SAF blenders tax credit. The base credit is \$0.35/gallon for aviation fuel, multiplied by the "emissions factor" of the fuel
- Continuous funding opportunities to support SAF projects and fuel producers.

\* Under legislature consideration.  
\*\* Non-mandate SAF policy incentives.



# 1<sup>ST</sup> ETHANOL POWERED

IPANEMA crop duster

**1ST CERTIFIED BIOFUEL AIRCRAFT IN THE WORLD**



The world's first and only ethanol-powered aircraft

# +300 THOUSAND

tons of CO2 avoided in the atmosphere





# EMBRAER BUILDING A SUSTAINABLE FUTURE

## Chartering the path towards a sustainable aviation

2024 Regional Seminar on Environment

ICAO



EMB 202 Ipanema  
1<sup>st</sup> Certified Biofuel  
aircraft in the world



2011

Azul E195 Sugarcane-  
Ethanol blend



2016

PW signs a MOU with  
Embraer to fly a 195E2  
on 100% SAF



2022



### E195-E2 100% SAF Flight

VERO BEACH REGIONAL AIRPORT  
100% HEFA-SPK NON-DROP-IN

2004



Embraer, GE  
E170, Camelina oil

2012



KLM 80 E190 flights  
using Camelina 25%  
SAF blend

2021

# SAF INVESTMENTS

Sustainable Flight Fund



*“Embraer is proud to join United Airlines Ventures Sustainable Flight Fund, which is aligned with our commitment to develop and support innovative solutions to address the growing need for a clean energy transition in aviation,”* said Leonardo Garnica, head of corporate innovation at Embraer. *“In a joint collaborative effort with our partners, we can accelerate large-scale SAF production as the aviation industry progresses toward the goal of net-zero emissions by 2050.”*





# Sustainable aviation – Research areas



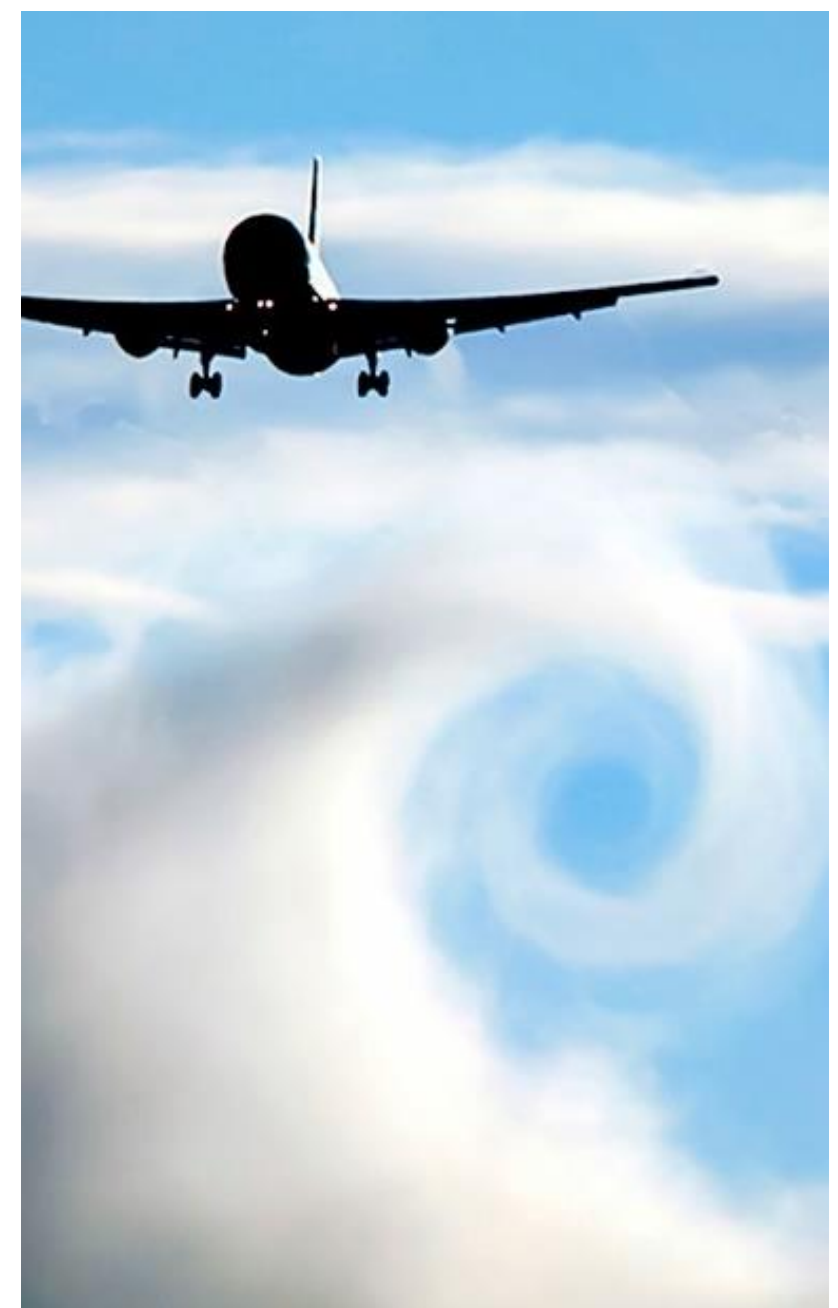
Sustainable Aviation Fuels (SAF)



Electrical & Hybrid-electrical Propulsion

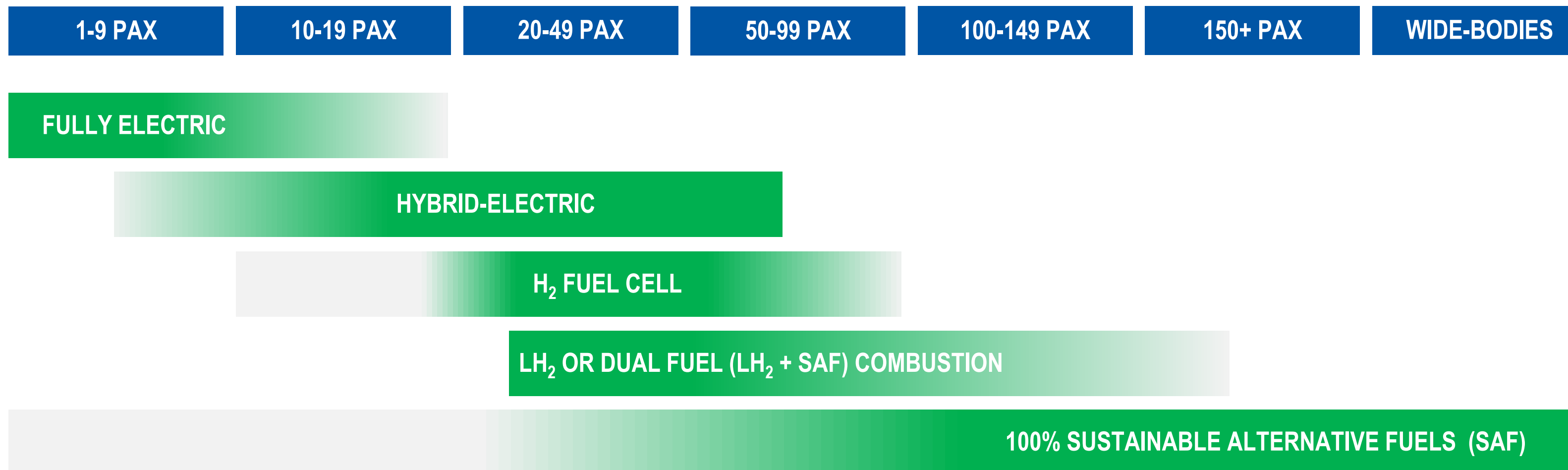


Hydrogen (Fuel Cell & Internal Combustion)



Aero-propulsive Integration & Advanced Materials

# Technology applicability



**“THE MISSION DEFINES THE ARCHITECTURE”**

Understand the mission to efficiently reduce aviation emissions



# ELECTRIC DEMONSTRATOR

IPANEMA modified as test bed



**2021 - FIRST FLIGHT 100% ELECTRIC**

Technology flight demonstrator to accelerate the knowledge on the integration of electric power systems

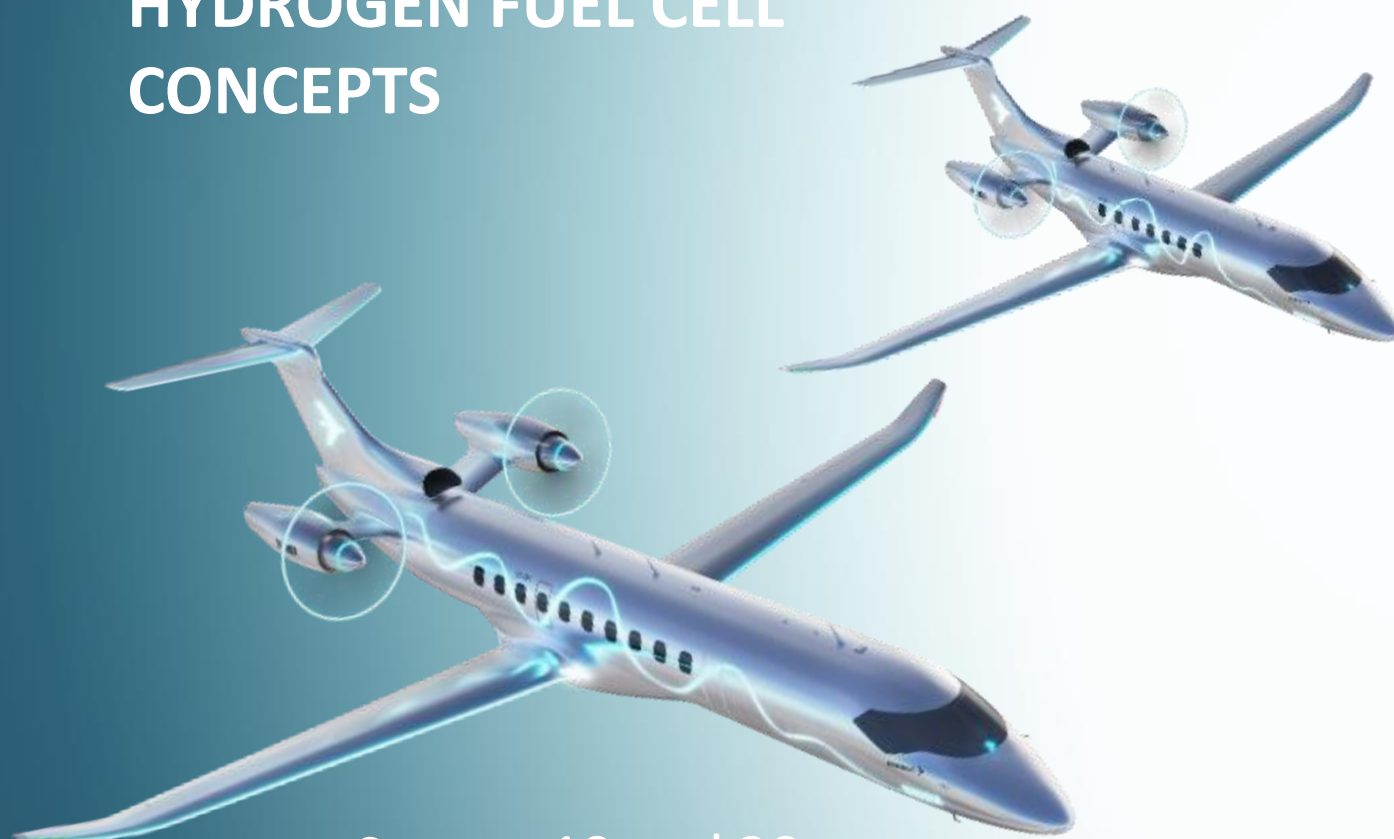


# Initial focus

19-30 SEATS  
FAMILY

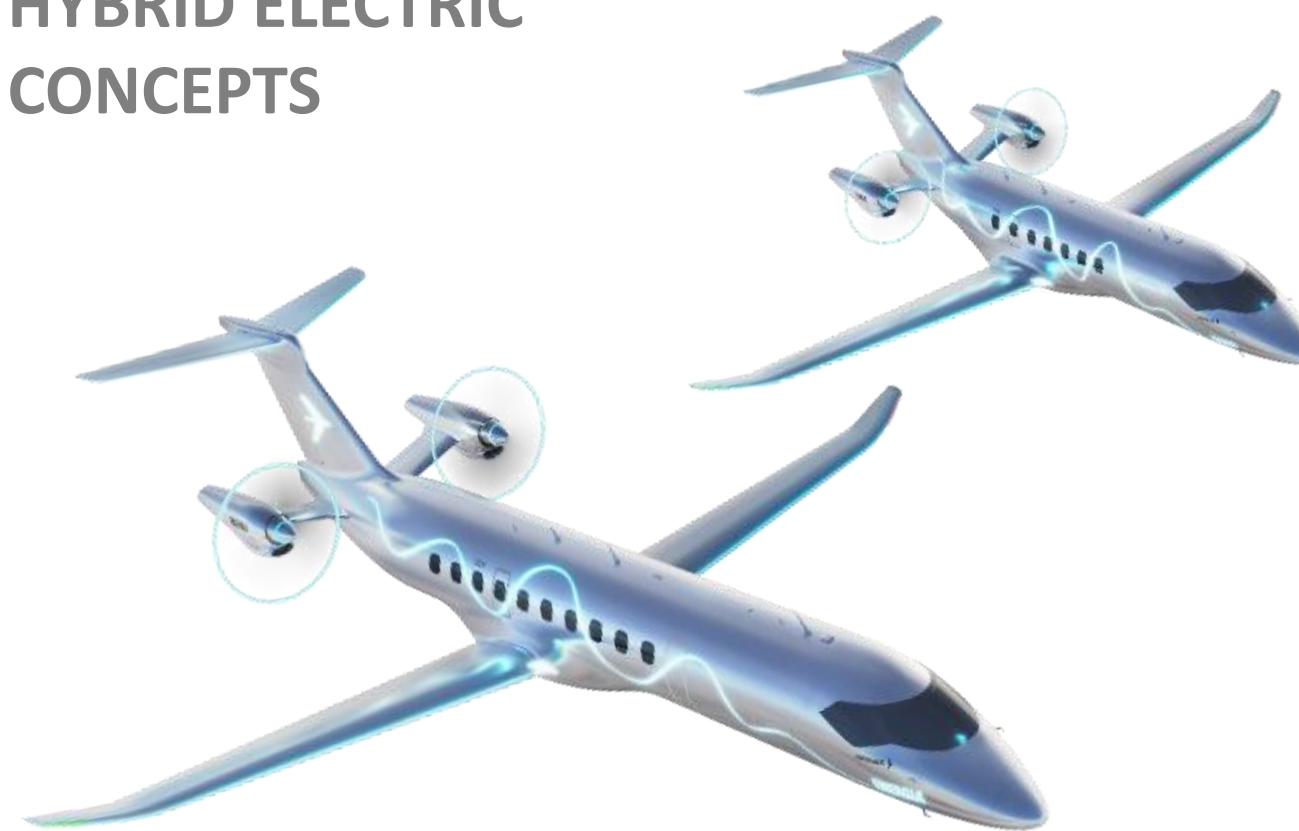
## Emphasis on hybrid electric and hydrogen electric

### HYDROGEN FUEL CELL CONCEPTS



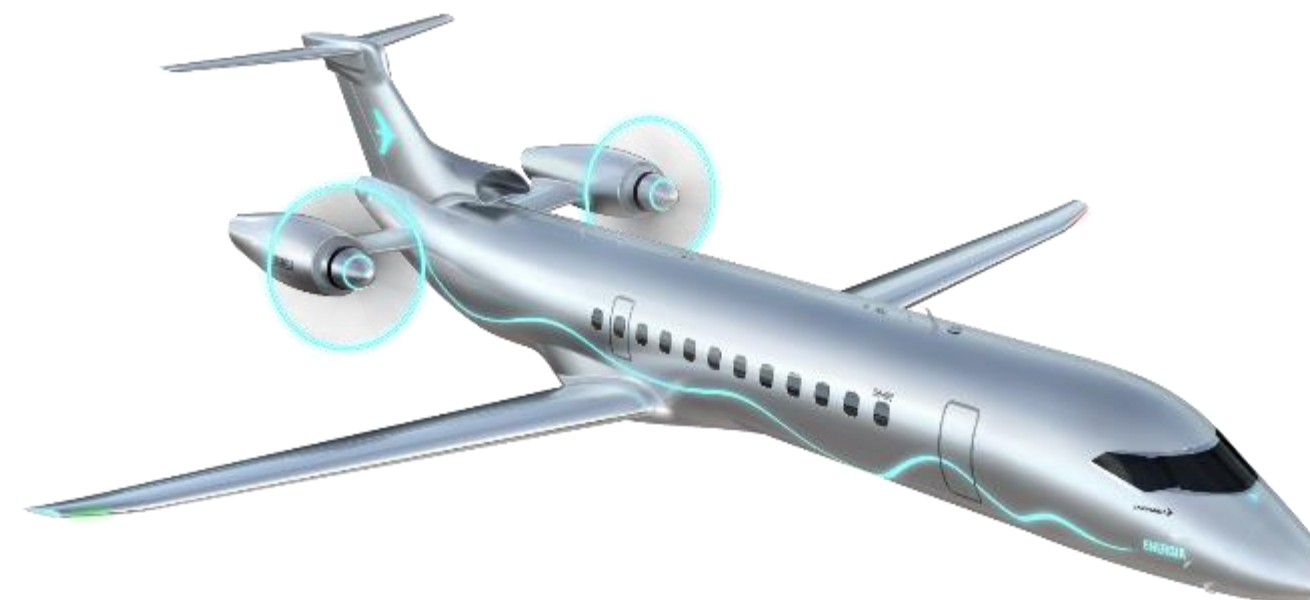
Seats	19 and 30
Range	200 nm
CO2 Reduction	100%
Tech Readiness	2035

### HYBRID ELECTRIC CONCEPTS



Seats	19 and 30
Range	500 nm
CO2 Reduction	25% (90% with SAF)
Tech Readiness	2030+

Studies extended to include **50 seaters** concepts



### ENERGIA FUEL CELL

Tech Readiness	2035
Range	600 nm
$\Delta$ CO <sub>2</sub> 250nm	-100%



### ENERGIA HYBRID-ELECTRIC

Tech Readiness	2030+
Range	600 nm
$\Delta$ CO <sub>2</sub> 250nm	-25% (90% if SAF)



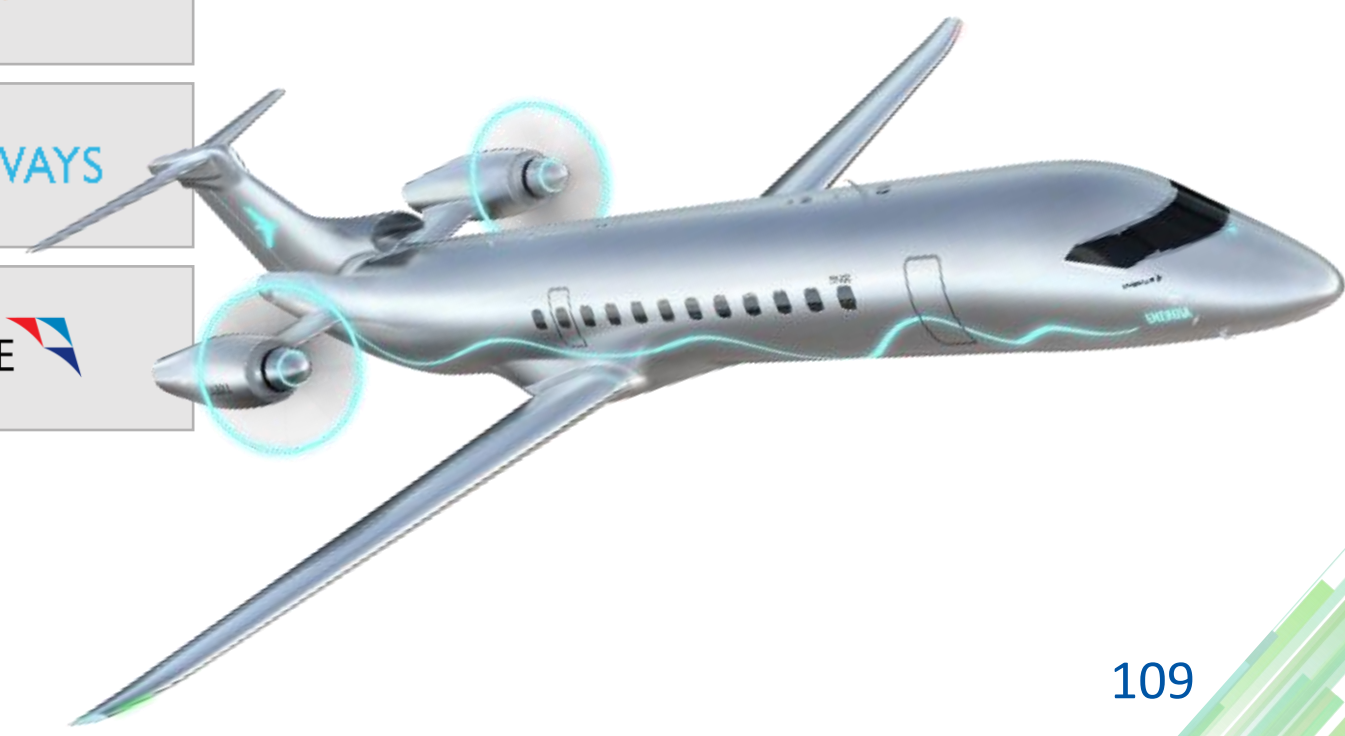
### ENERGIA HYDROGEN / DUAL FUEL GAS TURBINE

Tech Readiness	2038
Range	600 to 900nm
$\Delta$ CO <sub>2</sub> 250nm	-100%

# ENERGIA ADVISORY BOARD

Strong interest in low/zero emissions technology



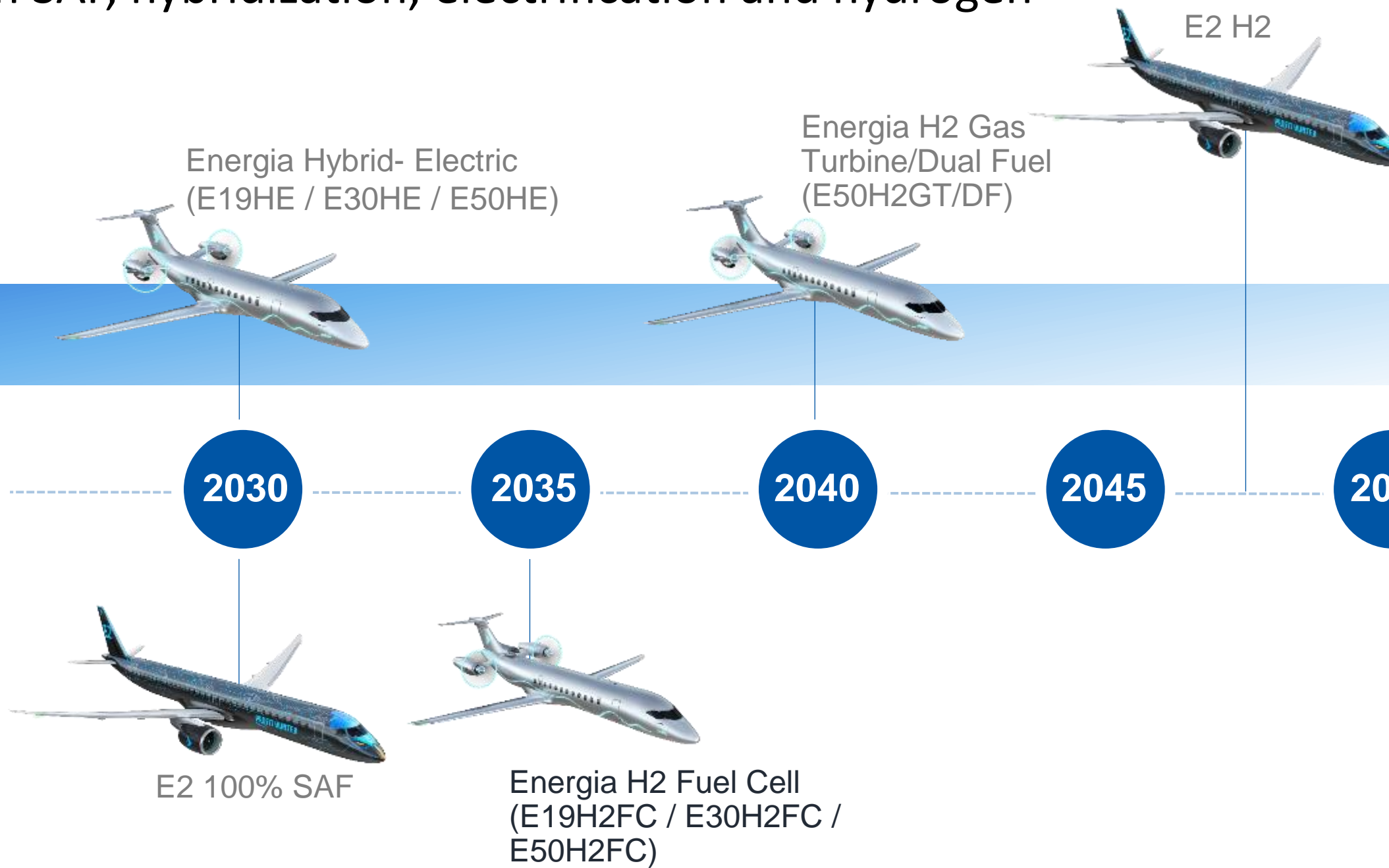
# EMBRAER'S SUSTAINABILITY ROADMAP

Decarbonizing aviation through SAF, hybridization, electrification and hydrogen

TODAY



E2 - Most efficient single-aisle aircraft  
**25% reduction in emissions per pax**



Thank You



THANK YOU