AGENDA EMBRAER EM SAF

Apresentação - CTCF / ProBioQAv

15 DE OUTUBRO DE 2021

AGENDA

1. Principais compromissos ambientais da Embraer
2. Atividades em SAF
3. Pontos relevantes para o ProBioQAv

PRINCIPAIS COMPROMISSOS AMBIENTAIS DA EMBRAER

PRINCIPAIS COMPROMISSOS AMBIENTAIS EMBRAER

COMMITMENT TO FLY NET ZERO 2050

ATAG AIR TRANSPORT ACTION GROUP

5 October 2021

As the global community emerges from the pandemic and the aviation sector rebounds from the worst crisis in its history, we will build on the success of previous sustainability efforts to push towards the third era of air transport: net-zero carbon global connectivity.

Scientific consensus shows that the Paris Agreement 1.5ºC goal would greatly reduce the severity of climate change damage. It is imperative that all sections of society and business set course to support achievement of this goal. The collective air transport sector raises its ambition with a new long-term climate commitment:

- **Global civil aviation operations will achieve net-zero carbon emissions by 2050, supported by accelerated efficiency measures, energy transition and innovation across the aviation sector and in partnership with governments around the world.**

This goal is ambitious and challenging for air transport. It will require coordinated efforts within the aviation industry and from partners, particularly strong support from governments and the energy sector. The goal will be underpinned by a commitment to joint and cooperative action between all stakeholders. Waypoint 2050 outlines a number of key elements to achieve the decarbonisation of air transport, including:

1. Increasing use of sustainable aviation fuels (SAF) and a transition away from fossil fuels by mid-century as part of a wider aviation energy shift including low-carbon electricity and green hydrogen.
2. Research, development and deployment of evolutionary and revolutionary airframe and propulsion systems, including the introduction of electric and / or hydrogen powered aircraft.
3. Continued improvements in efficiency of operations and infrastructure across the system, including at airports and by air navigation service providers.
4. Investment in high-quality carbon offsets in the near-term and carbon removal opportunities to address residual CO_2 emissions in the longer-term. In this regard, the industry reaffirms its full support for the International Civil Aviation Organization (ICAO) Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) as an effective transitional measure to stabilise net emissions from international aviation.

Across the sector, we are already undertaking a vast range of activities to reduce aviation CO_2 emissions. Our unwavering commitment to respond to the challenge of climate change has not abated despite the crisis we have faced. To achieve net-zero, the sector will require a supportive policy framework from governments focused on innovation rather than cost-inefficient instruments such as uncoordinated taxes or restrictive measures, as well as a robust and full commitment from the energy industry and other stakeholders. As support at the global level is critical, we urge ICAO member states to support the adoption of a long-term aspirational climate goal at the 41st ICAO Assembly in 2022.

Many long-term solutions require an acceleration of activity in the next decade, particularly the deployment of SAF. Some, such as continued efficiency gains, improvements in air traffic management and the implementation of CORSIA, can provide early climate action whilst longer-term measures are developed.

We are committed to ensuring that aviation in 2050 will be able to meet the needs of over 10 billion passengers, connecting the world safely, securely and importantly, sustainably. Further details can be found at www.aviationbenefits.org/FlyNetZero

ACI AIRPORTS COUNCIL INTERNATIONAL — Luis Felipe de Oliveira, Director General

CANSO — Simon Hocquard, Director General

IATA — Willie Walsh, Director General

IBAC International Business Aviation Council — Kurt Edwards, Director General

Jan Pie, Chair

Supported by innovation and action throughout the supply chain:

AIRBUS — Guillaume Faury, Chief Executive Officer

BOEING — Stan Deal, President and CEO

ATR — Stefano Bortoli, Chief Executive Officer

CFM — Gaël Méheust, President and CEO

GE — John S. Slattery, President and CEO

Christopher Calio, President

Rolls-Royce — Warren East, Chief Executive Officer

SAFRAN — Olivier Andriès, Chief Executive Officer

EMBRAER — Francisco Gomes Neto, President and CEO

Collins Aerospace — Stephen Timm, President

Escopo 1+2:

- Crescimento neutro em carbono a partir de 2022;
- Uso de SAF em nosso processos a partir de 2021;
- Neutralidade em carbono até 2040.

Escopo 3:

- Desenvolvimento de produtos, serviços e tecnologias para aviação “Net-Zero Carbon 2050”;
- Aeronaves 100% compatíveis com SAF;
- Engajamento com fornecedores e parceiros para expandir produção global de SAF.

Source: https://aviationbenefits.org/FlyNetZero and https://esg.embraer.com/global/en

ATIVIDADES DA EMBRAER EM SAF

SAF - ATIVIDADES NA EMBRAER

Protótipo E170
HEFA – 2011
Óleo de camelina

EMBRAER

Testes em solo e voo
em Gavião Peixoto, SP

AZUL E195
SIP – 2012
Cana de açúcar

Azul EMBRAER AMYRIS

Voos demo com passageiros,
Durante a UN Rio+20.
Rota: VCP – SDU - VCP

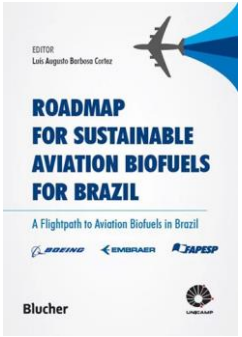
KLM Cityhopper E190
HEFA - 2016
Óleo de camelina

Projeto EU FP-7 ITAKA
Initiative **T**owards sust**A**inable
Kerosene for **A**viation
80 voos comerciais: OSL - AMS

ITAKA Project: https://www.senasa.es/index.php?lang=es-ES&idPag=573

MAIS ATIVIDADES EM SAF

2014



Roadmap publicado com os resultados dos workshops em:

- Matérias primas
- Tecnologias de conversão
- Sustentabilidade
- Logística
- Comercialização
- Aspectos regulatórios

2016

Conceito de Biorrefinaria

Estudo com 12 cenários para a transformação de uma usina de açúcar em biorrefinaria:

- HEFA (macaúba, palma e óleo de soja)
- FT (palha e bagaço de cana e resíduos de eucaliptos)
- ATJ(etanol de 1ª e 2ª geração e isobutanol)

2019-2023

BioValue

BECOOL

HORIZON 2020 CONSORTIUM

Investigação técnica, econômica, ambiental e social de diferentes biomassas para produzir combustíveis avançados, incluindo SAF:

- Palha e bagaço de cana
- Cana energia
- Resíduos de florestas plantadas

Roadmap SABB: http://pdf.blucher.com.br.s3-sa-east-1.amazonaws.com/openaccess/roadmap-aviation/completo.pdf
Conceito de biorrefinaria: https://www.sciencedirect.com/science/article/abs/pii/S030626191731499X
BioValue: https://lnbr.cnpem.br/biovalue/

BIORREFINARIA PRODUTORA DE SAF - PRINCIPAIS RESULTADOS

- Considerando uma usina de açúcar no Centro-Oeste brasileiro, processando 4 milhões de toneladas de cana de açúcar/ano com que recuperação de 50% da palha da cana do campo;
- Meta de produção de 375.000 m^3/ano de SAF.

Cenário	Rota	Matéria-prima para biojet fuel	Produção de H_2	*Target* de 5% de substituição de jet fuel fóssil	# plantas para *target* de 5%	Produção		
						Diesel (milhões L/ano)	Etanol (milhões L/ano)	Energia elétrica (GWh/ano)
1a	HEFA	Palma	Eletrólise	71%	2	122	360	0
1c	HEFA	Macaúba	Eletrólise	69%	2	118	360	0
1e	HEFA	Soja	Eletrólise	61%	2	105	360	0
3d	ATJ	Isobutanol	Eletrólise	43%	3	4	0	631
1b	HEFA	Palma	Reforma de etanol	38%	3	65	0	630
3c	ATJ	Etanol 1G2G	Eletrólise	37%	3	11	0	0
1d	HEFA	Macaúba	Reforma de etanol	37%	3	63	0	637
1f	HEFA	Soja	Reforma de etanol	33%	3	57	0	649
3a	ATJ	Etanol 1G	Eletrólise	28%	4	8	0	525
2b	FT	Cana+Eucalipto	Gaseificação	27%	4	81	360	45
3b	ATJ	Etanol 1G	Reforma de etanol	20%	5	6	0	657
2a	FT	Cana	Gaseificação	11%	9	33	360	156

PONTOS RELEVANTES PARA O PROBIOQAV NA VISÃO EMBRAER

PONTOS RELEVANTES

- Definição de Diretriz Nacional para o SAF;

- Adequação tributária:
  - Adequação fiscal;
  - Definição da carga tributária;
  - Previsibilidade para “Book & Claim”.

- Linhas de financiamento para instalação de novas plantas (CAPEX e OPEX);

- Aprimoramento para a implantação de cadeia: da matéria prima até a entrega no Aeroporto (mapeamento de demandas, gargalos e oportunidades).

OBRIGADO

embraer.com

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