

The banner features a green and blue background with stylized hills, a sun, and two airplanes. One airplane is shown from a side profile, and the other is shown from a top-down perspective, flying over a globe. The text is in white and blue.

ICAO Symposium on Non-CO₂ Aviation Emissions

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Montréal, Canada

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Speaker

Session 3: Mitigating Non-CO₂ Aviation Emissions –
What is possible
Part I – Innovative Technologies



Embraer Energia Concepts: Overview & Non-CO2 Characteristics

Outline

01

Environmental Commitments

Scopes 1, 2 and 3

02

The Energia Approach

Design Space Exploration

03

Complete Feasibility

A Broad View

04

Concepts Overview

Non-CO2 Characteristics

01

Environmental Commitments

Scopes 1, 2 and 3



Embraer Environmental Commitments

Scope 1 Direct Emissions

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

Regular usage of SAF from
2021 at Embraer's units

Reaching 25% of SAF in
our operations by 2040

Scope 2 Indirect Emissions

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

Scope 3 Product lifecycle emissions

Solutions to net zero carbon
emissions in aviation by 2050

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

Collaborate to **expand
SAF production**

Keep **improving the efficiency**
of our current portfolio

New technologies: EVTOL,
Energia Family...

Flying with SAF – Since 2005



2005 – Ipanema
Ethanol (Unleaded)



2011 – E170
HEFA (Camelina oil)



2012 – E195 AZUL
SIP – Sugarcane



2016 – E190 KLM
HEFA Camelina Oil



2019 – Legacy 450
ATJ – wood residue



2019 – Praetor 600
ATJ – wood residue



2022 – E195-E2
100% SAF HEFA-SPK



2023 - Phenom 300 & Praetor 600
100% SAF HEFA-SPK

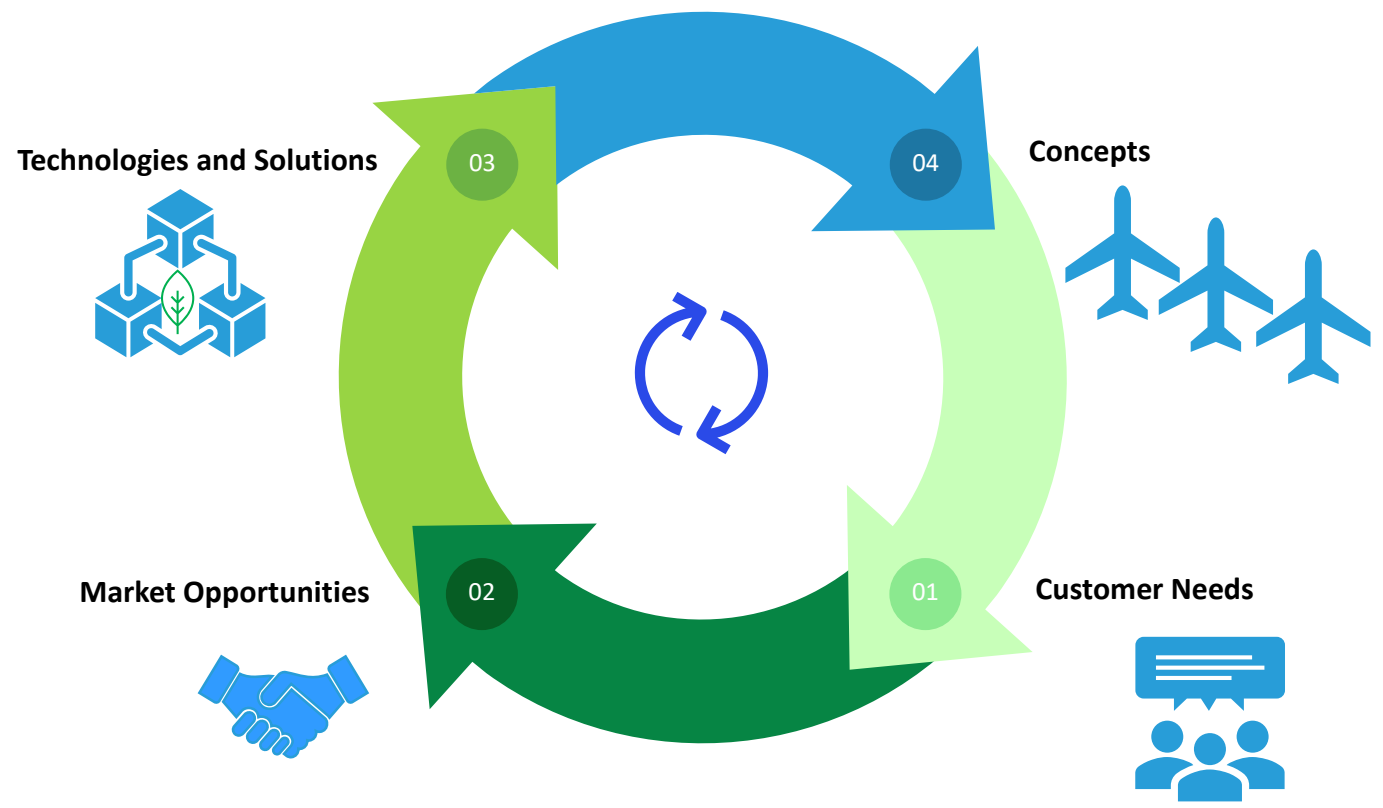
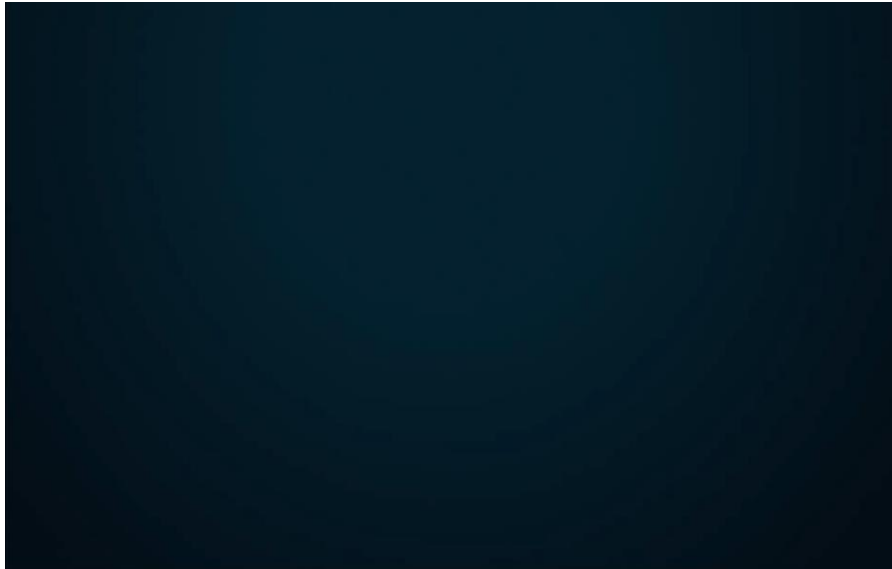
02 The Energia Approach

Design Space
Exploration



Energia Concepts

Exploring the design space, searching for the most competitive solutions



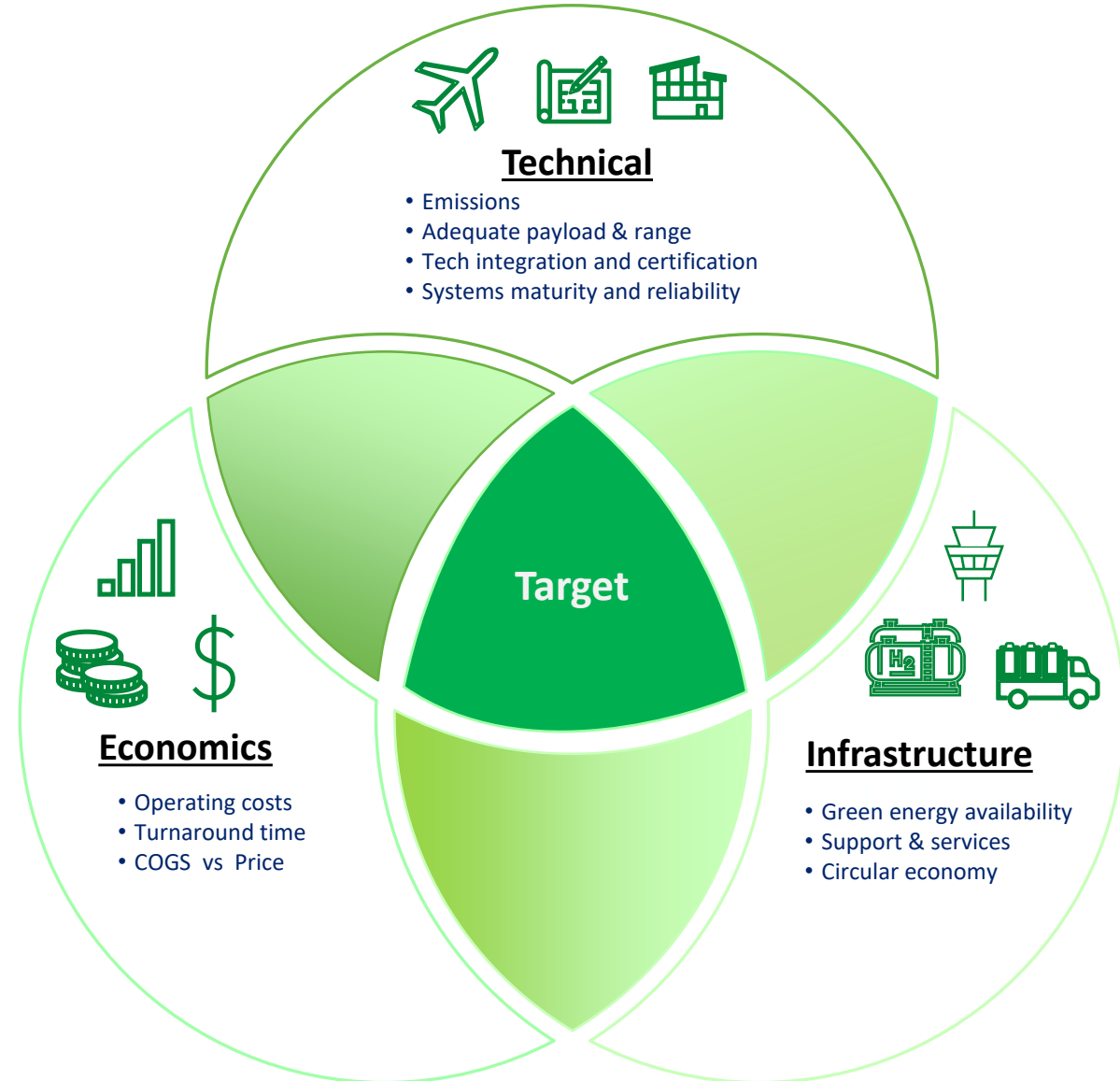
03 Complete Feasibility

A broad view



Complete Feasibility

Much beyond technology development



04 Concepts Overview

Non-CO2
Characteristics



Regional 50-seaters, cruising below FL300

- Lower contrails formation probability [1]
- Lower NOx climate effects [2]

NextGen thermal engine

- Potential for post-treatment [3]

Electric taxi (prop-driven)

- Lower LAQ Impact

Low-NOx H2 combustor [4]

- Zero soot
- Potential for decreased contrails impacts [1]

High aspect ratio wing

- Lower overall emissions

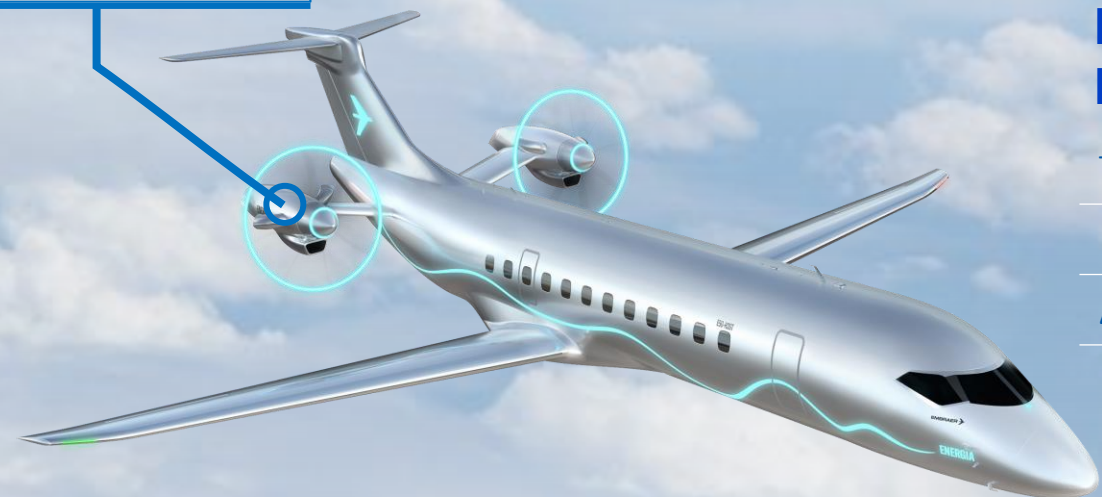
LT/HT PEM FC Propulsion

- Zero NOx, soot, nvPM
- Potential for decreased contrails impacts [1]



ENERZIA HYBRID-ELECTRIC

Tech Readiness	2030+
Range	600 nm
ΔCO_2 250nm	-25% (90% if SAF)



ENERZIA HYDROGEN / DUAL FUEL GAS TURBINE

Tech Readiness	2038
Range	600 to 900nm
ΔCO_2 250nm	-100%



ENERZIA FUEL CELL

Tech Readiness	2035
Range	600 nm
ΔCO_2 250nm	-100%

[1] Clean Sky2, "Hydrogen-powered aviation A fact-based study of hydrogen technology, economics, and climate impact by 2050", 2020.
 [2] R. Miake-Lye and Hauglustaine D., "Impacts of Aviation NOx Emissions on Air Quality, Health, and Climate", 2022.
 [3] Prashanth et al., "Post combustion emissions control in aero-gas turbine engines", 2020.
 [4] See Rolls-Royce Clean Aviation CAVENDISH project: <https://cordis.europa.eu/project/id/101102000>

Thank You

