ICAO Symposium on Non-CO_2 Aviation Emissions

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Raphael Felipe Gama Ribeiro

Conceptual Studies Lead

Embraer Energia

Speaker

Session 3: Mitigating Non-CO_2 Aviation Emissions – What is possible

Part I – Innovative Technologies

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Embraer Energia Concepts: Overview & Non-CO2 Characteristics

Outline

01

Environmental Commitments

Scopes 1, 2 and 3

Embraer Environmental Commitments

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

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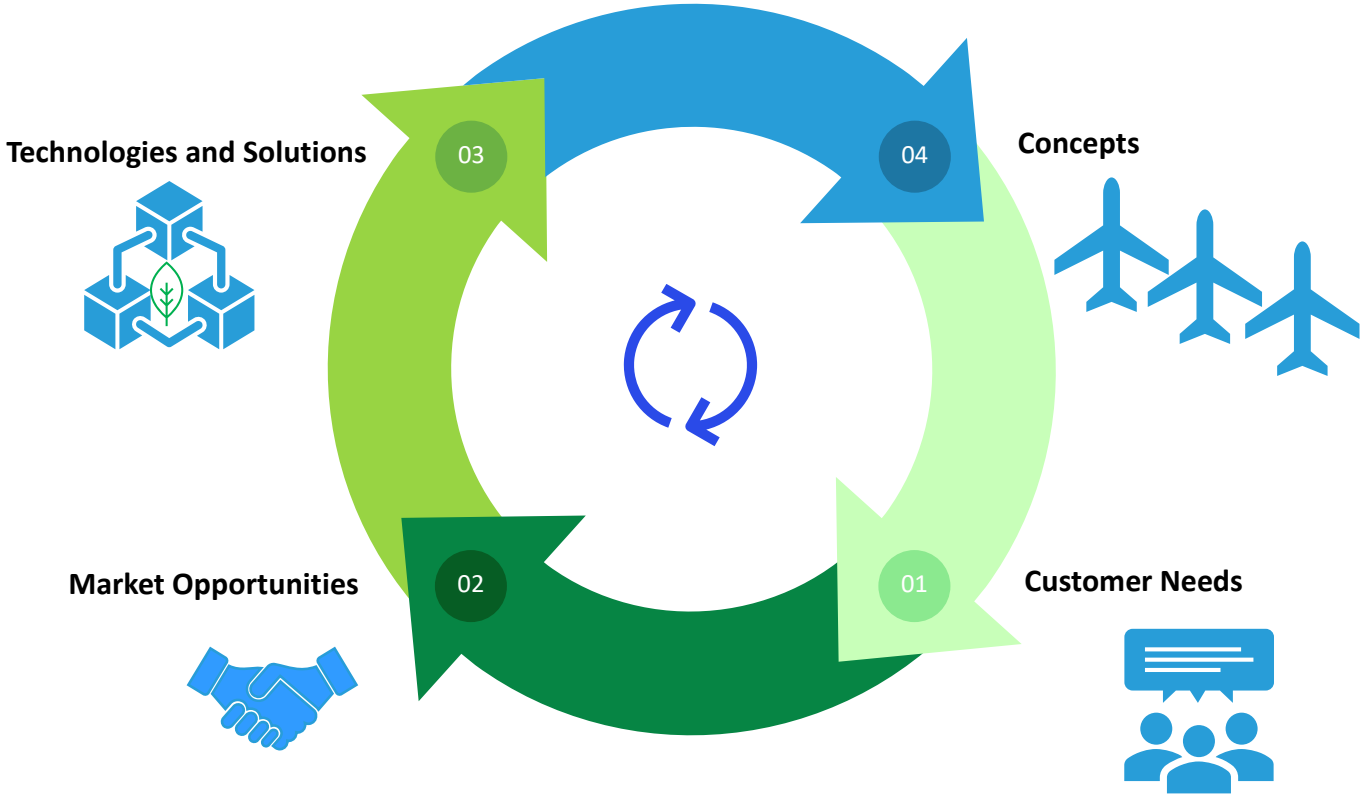
02

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]

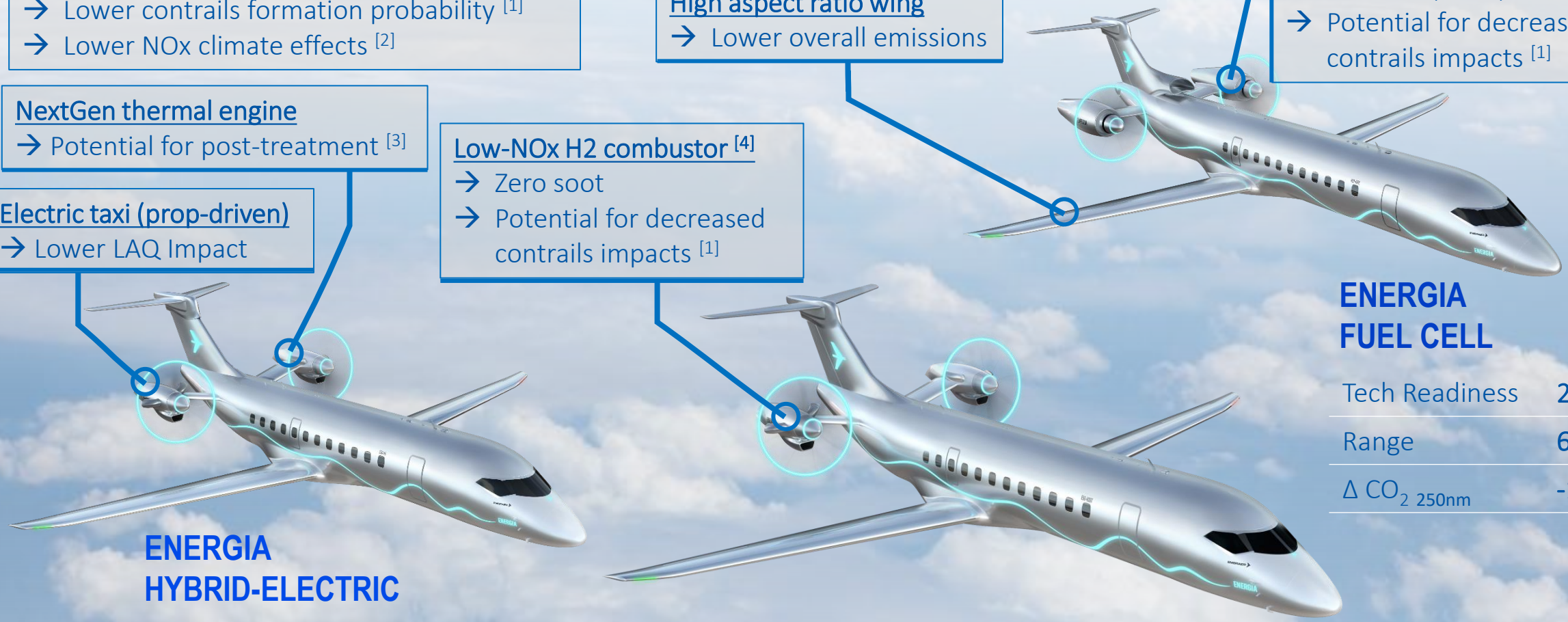
NextGen thermal engine
→ Potential for post-treatment [3]

Electric taxi (prop-driven)
→ Lower LAQ Impact

High aspect ratio wing
→ Lower overall emissions

Low-NOx H2 combustor [4]
→ Zero soot
→ Potential for decreased contrails impacts [1]

LT/HT PEM FC Propulsion
→ Zero NOx, soot, nvPM
→ Potential for decreased contrails impacts [1]



ENERGIA HYBRID-ELECTRIC

Tech Readiness	2030+
Range	600 nm
Δ $CO_{2\ 250nm}$	-25% (90% if SAF)

ENERGIA FUEL CELL

Tech Readiness	2035
Range	600 nm
Δ $CO_{2\ 250nm}$	-100%

ENERGIA HYDROGEN / DUAL FUEL GAS TURBINE

Tech Readiness	2038
Range	600 to 900nm
Δ $CO_{2\ 250nm}$	-100%

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[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

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