

An abstract graphic featuring flowing, liquid-like blue and white shapes against a dark background. A prominent circular element with concentric rings is visible in the upper left, and a sharp, arrow-like shape points towards the top right.

**74<sup>th</sup> Association of South Pacific Airlines  
General Session**

# **Embraer's Sustainability Roadmap**

**Brisbane, 9<sup>th</sup> September 2022**

# 50+ YEARS OF INNOVATION WITH PRESENCE IN EVERY SECTOR

LEADER IN DESIGN, DEVELOPMENT, MANUFACTURING AND AFTER SALES  
SUPPORT FOR AEROSPACE AND DEFENSE SYSTEMS SOLUTIONS



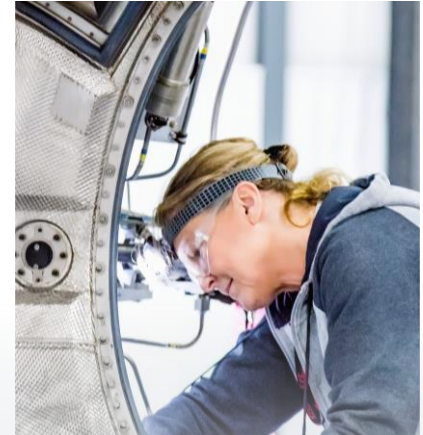
**Defense & Security**



**Commercial Aviation**



**Executive Aviation**



**Services & Support**

# EMBRAER: AN ENGINEERING POWERHOUSE

THE ONLY OEM TO DEVELOP 21 DIFFERENT AIRCRAFT WITHIN 21 YEARS



**ERJ145 XR**  
2001



**ERJ140**  
2000



**E170**  
2002



**E175**  
2003



**E190**  
2004



**E195**  
2004



**Lineage 1000**  
2007



**Phenom 100**  
2007



**Phenom 300**  
2008



**Legacy 650**  
2009



**Legacy 600**  
2000



**Legacy 500**  
2012



**Legacy 450**  
2013



**Praetor 500**  
2018



**Praetor 600**  
2018



**E190-E2**  
2016



**E195-E2**  
2017



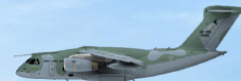
**E175-E2**  
2019



**R99**  
1999



**Super Tucano**  
1999



**KC390**  
2015

\* Year of First Flight

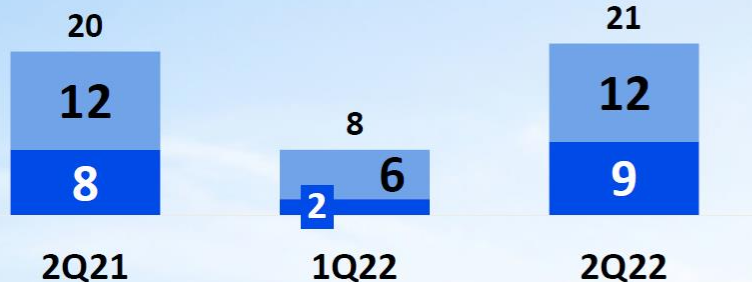
# AIRCRAFT DELIVERIES

## COMMERCIAL AVIATION



2022 Outlook: 60 – 70

## EXECUTIVE AVIATION

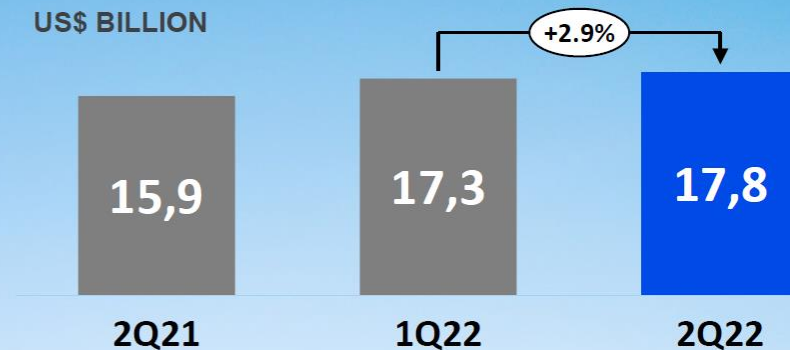


Light Jets Medium Jets

2022 Outlook: 100 – 110

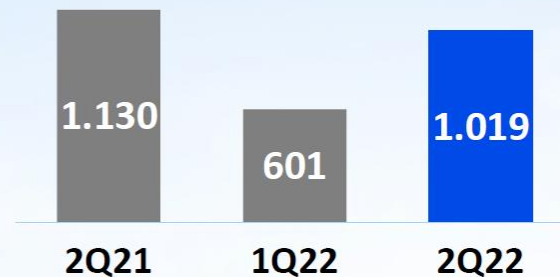
# BACKLOG

US\$ BILLION

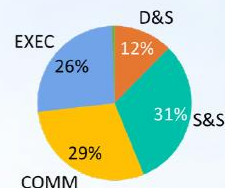


# NET REVENUES

US\$ MILLION



## BREAKDOWN BY BUSINESS



2022 Outlook: US\$ 4.5 – 5.0 Billion





## environmental

- Carbon neutrality in operations by 2040
- Carbon neutral growth from 2022
- Energy 100% from renewable sources by 2030
- Products for zero carbon aviation by 2050



## social

- Ongoing training in Diversity & Inclusion
- Commitment to having 50% diversity in hiring
- 25% women in the Master's Program in Aeronautical Engineering
- 20% women in senior leadership positions
- Maintain approval of more than 80% of students at Embraer Colleges in public universities
- Launch of the 'Social Tech' Program



## governance

- Robust Ethics and Compliance program, fully aligned with global standards
- Maintain the highest international standards of governance
- To maintain the high safety standards of our products and total alignment with international requirements





# EMBRAER'S 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,  
TPNG, Energia Family...

# 18 YEARS OF WORKING WITH BIOFUELS AT EMBRAER

## CHARTING THE PATH TOWARDS A GREEN AND SUSTAINABLE AVIATION INDUSTRY



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



Azul E195 Sugarcane-  
Ethanol blend



KLM 80 E190 flights using  
Camelina 25% SAF blend



Advanced biomass fuel  
production from sugarcane  
bagasse and forest residues



Embraer, GE  
E170, Camelina oil



Brazil SAF  
Roadmap



Tested biorefinery of  
Soybean oil and Ethanol





# E195-E2 COMPLETES 100% SAF FLIGHT TESTING

JUNE 2022: 70-MINUTE FLIGHT AT VERO BEACH REGIONAL AIRPORT – FL, USA.

➤ Our industry can start reducing CO2 emissions now by:

1. Replacing legacy aircraft with more fuel-efficient new-generation solutions.
2. Scaling up SAF production.

➤ The E2 is the most efficient single-aisle aircraft today, reducing CO2 emissions by 25%.

➤ The E2 is currently certified to operate with SAF blended up to 50% with standard JetA/A1





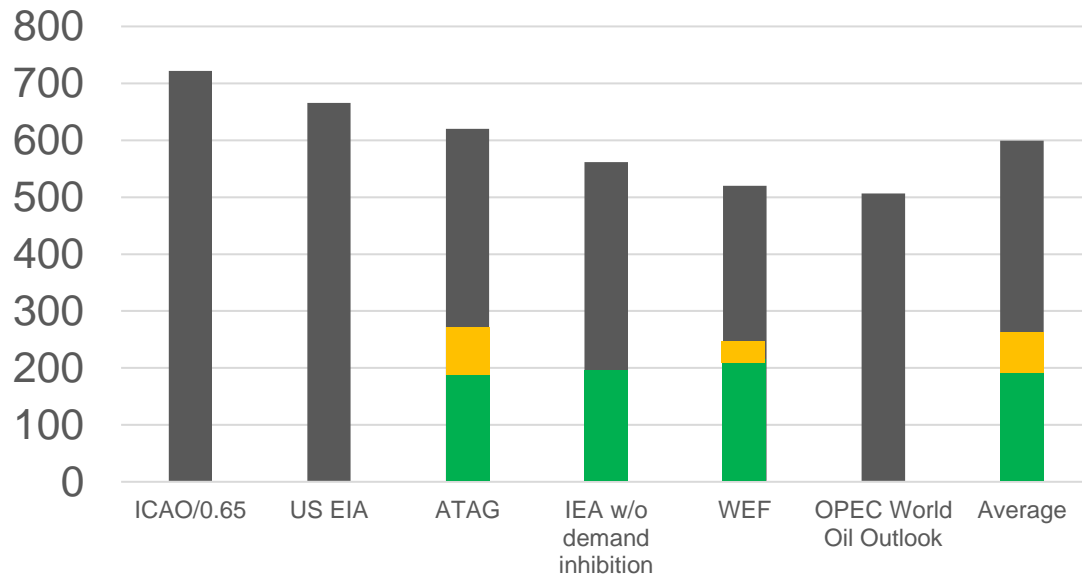
# SUSTAINABLE AVIATION FUEL

On top of 200 Mt of BioJet,  
PtL Power to Liquid can  
supply more than 70 Mt of  
SAF by 2050<sup>[1][2]</sup>

PtL will require cheap  
electrical energy, cheap  
green H2 and cheap CO2  
capture technologies

**SAF** (BIOFUELS PLUS PTL) **WILL SUPPLY ~45% OF ALL**  
**600MT COMMERCIAL AVIATION DEMAND BY 2050**

MTONS



# REGIONAL AVIATION WILL PIONEER DISRUPTIVE TECHNOLOGIES

Hydrogen and Electricity  
will take a long time to be  
techno-economic viable  
solutions to decarbonize  
aviation.

Fuel loaded<sup>[1]</sup>: 20,700 kg (equivalent to ~248 MWh)<sup>[2]</sup>

## Battery constraints

Battery Specific Energy <sup>[3]</sup> [Wh/kg]	Battery Weight [kg]
200 (today)	540 000
500	216 000
1000	108 000

## H2 constraints

Density [kg/m <sup>3</sup> ]	Volume [m <sup>3</sup> ]
Jet-A: 803	26
LH2: 71	134 <sup>[4]</sup>

[1] Fuel Ref: ICAO Independent Expert Integrated technology goals assessment and review for engines and aircraft, 2019 - 165 pax + baggage, 3500nm range

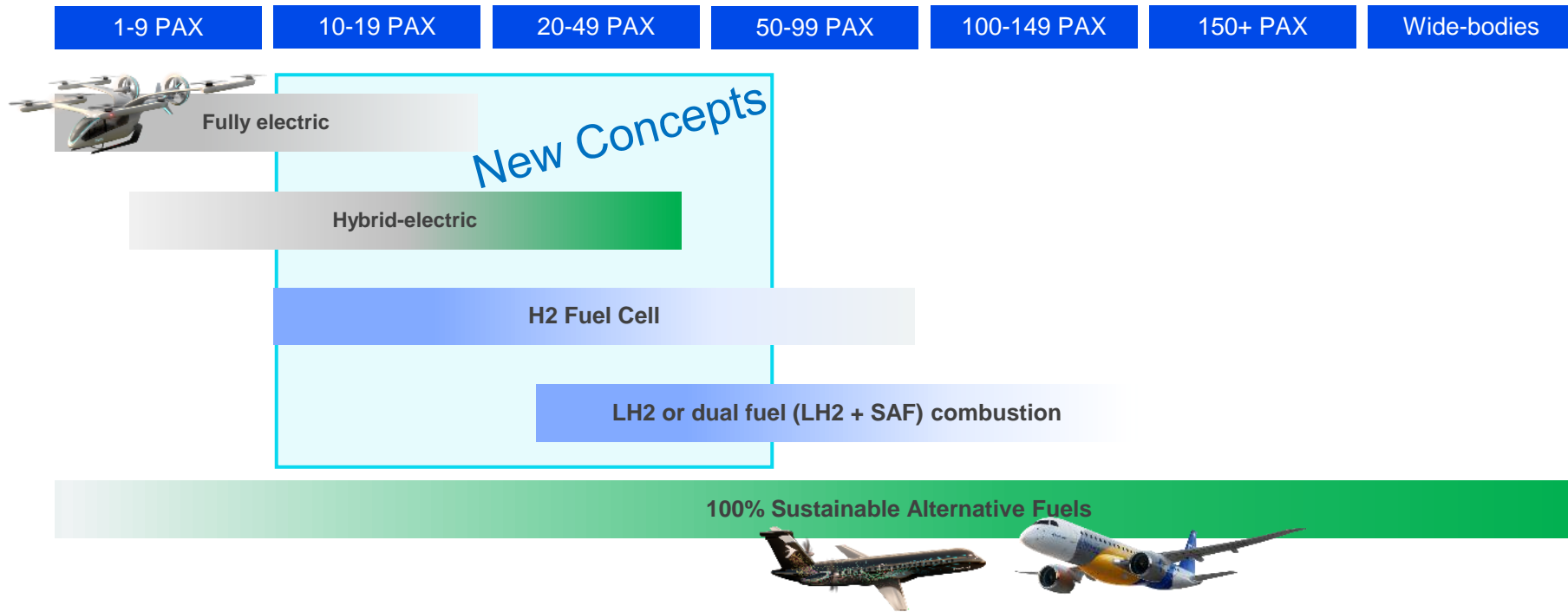
[2] Assumes gas turbine thermal efficiency ~ 40% (cruise), fully electric conversion efficiency ~ 90%

[3] Pack level

[4] Volume utilization 80%

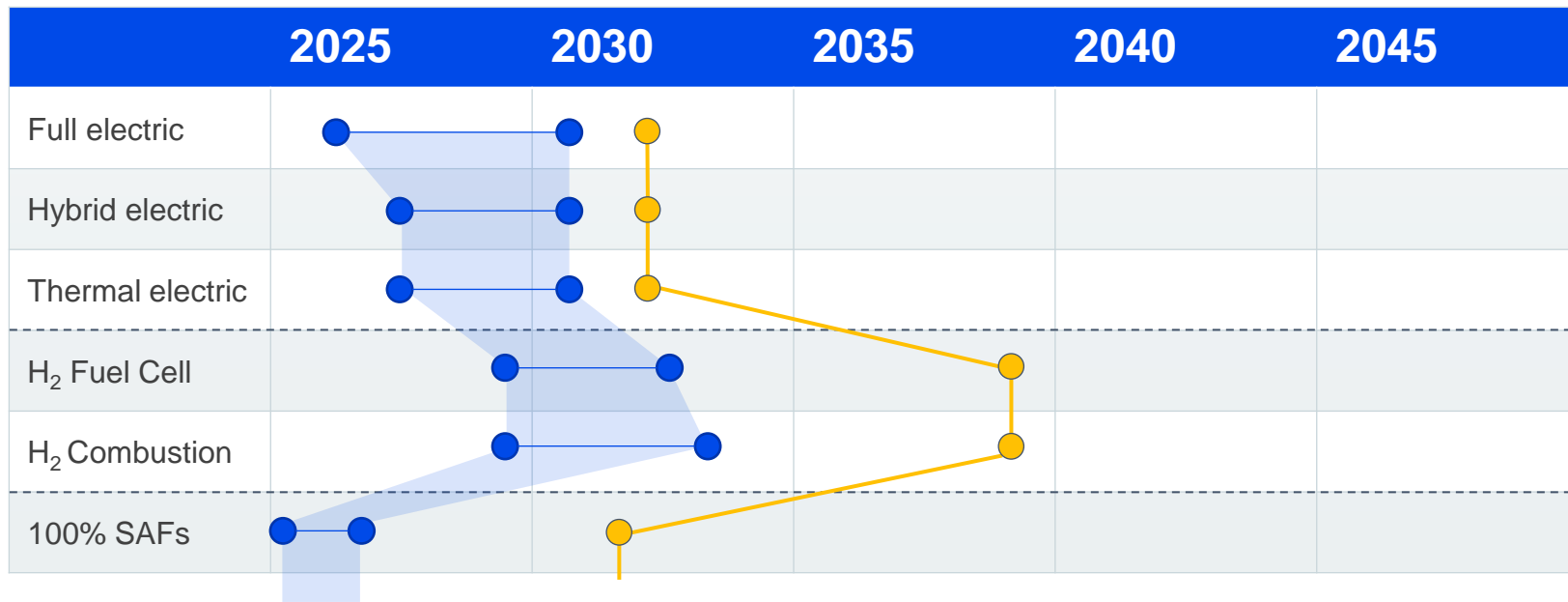
# TECHNOLOGY APPLICABILITY

THE MISSION DEFINES THE ARCHITECTURE". CONSTANT LEARNING & EVOLUTION.





# LARGE SCALE DEPLOYMENT WILL BE DRIVEN BY ECOSYSTEM READINESS, NOT BY “CERTIFICABILITY”

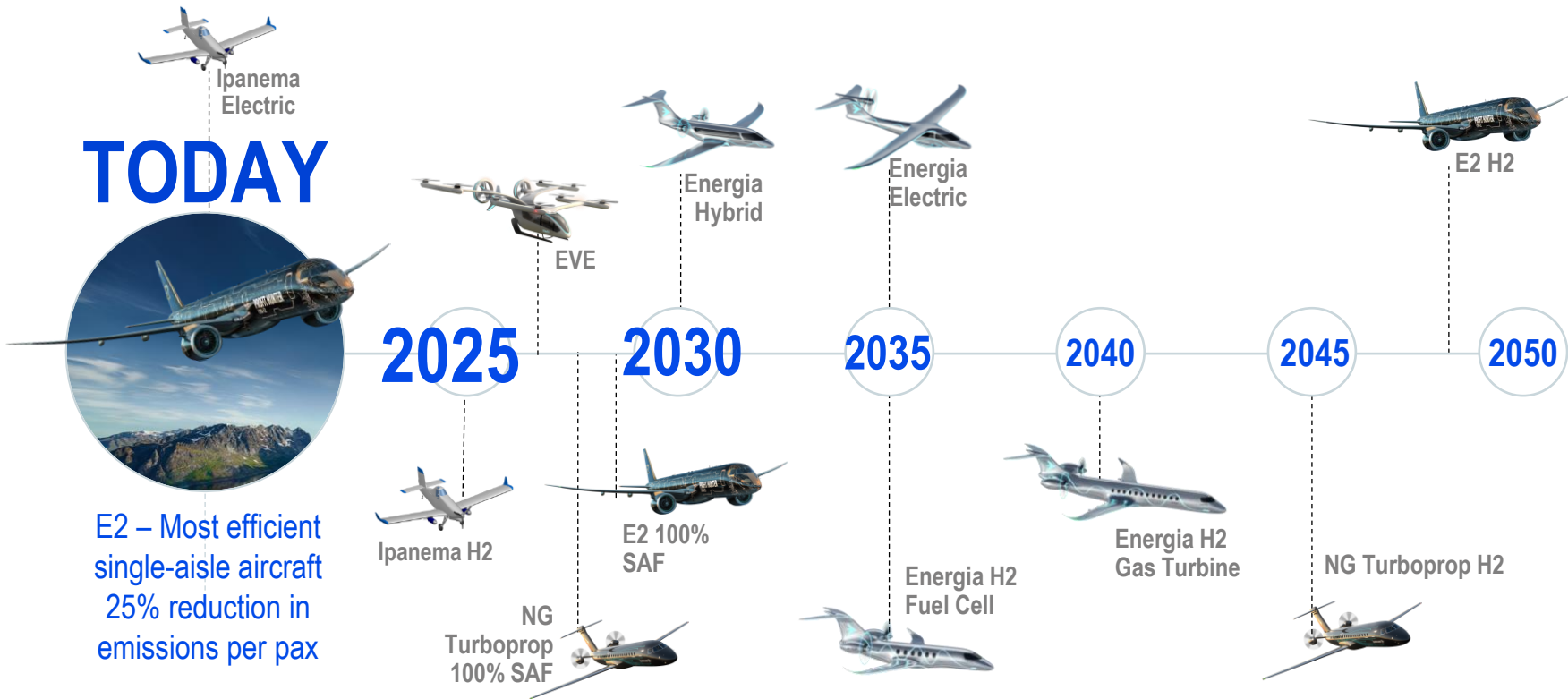


*Estimated certification readiness  
for applications **between 19-50 PAX***

*Estimated ecosystem readiness  
(infrastructure, economics)*

# EMBRAER'S SUSTAINABILITY PRODUCT ROADMAP

DECARBONISING AVIATION THROUGH SAF, HYBRID, ELECTRIC AND HYDROGEN





# EMBRAER TPNG





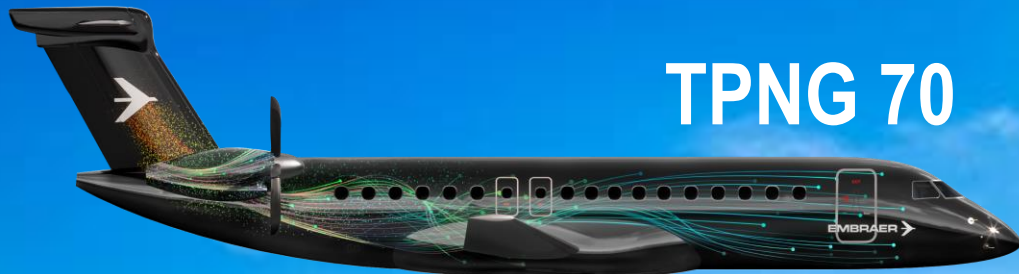
# FAMILY CONCEPT

SEATING FROM 70 TO 90  
PASSENGERS

TPNG 90



TPNG 70



# REAR MOUNTED ENGINE DESIGN BENEFITS

CLEAN SHEET DESIGN WITH EMBRAER DNA



## Rear Mounted Advantages

- Jet bridge access
- Less cabin noise and vibration
- More efficient wing
- Shorter landing gear
- Future propulsion adaptability
- Less asymmetry for OEI







# ENERGIA FAMILY





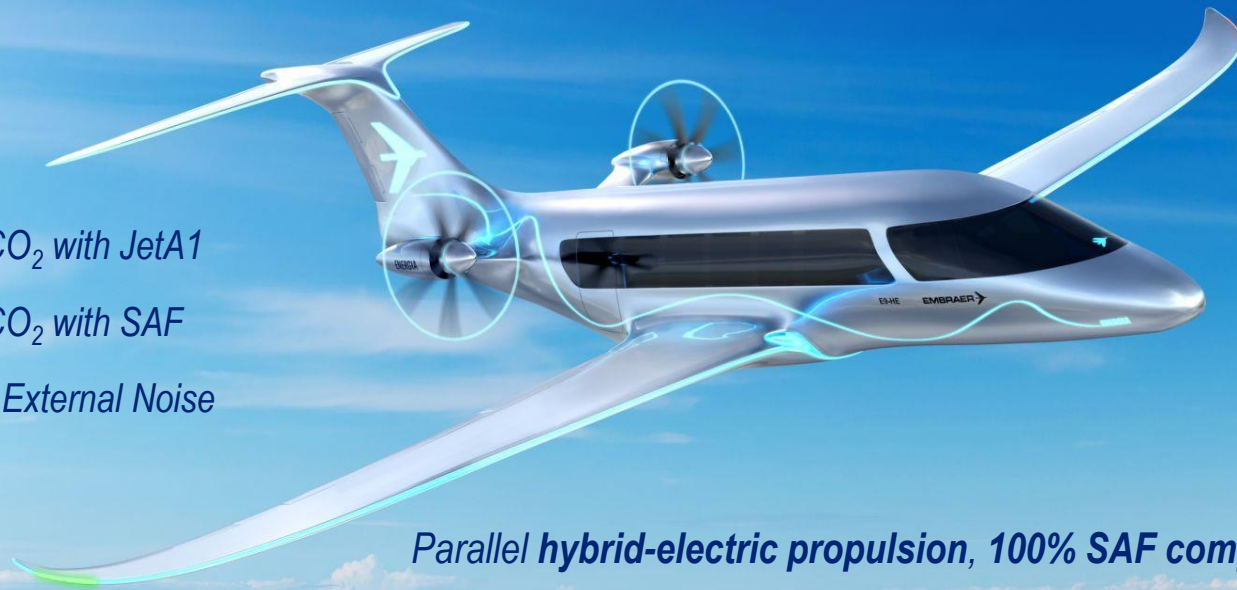
# ENERGIA HYBRID

9-SEAT CAPACITY, 500 NM RANGE, EIS BEFORE 2030

**50%** less CO<sub>2</sub> with JetA1

**90%** less CO<sub>2</sub> with SAF

**60%** lower External Noise



*Parallel **hybrid-electric propulsion**, 100% SAF compatible*

*Piston engine **optimised for cruise***

*Air-cooled electric motors **streamlines thermal management system***





# ENERGIA ELECTRIC

9-SEAT CAPACITY, 200 NM RANGE, EIS BY 2035

**Zero** CO<sub>2</sub> emissions

**80%** lower External Noise



**Full electric propulsion**

Aft contra-rotating propellers **increase efficiency**  
**and reduce cabin noise**

**Ultra efficient aerodynamics** with glider-inspired  
high aspect ratio wing and retractable landing gear



# ENERGIA H2 FUEL CELL

19-SEAT CAPACITY, 200 NM RANGE, EIS BY 2035

**Zero** CO<sub>2</sub> emissions

**70%** lower External Noise



*Electric propulsion **powered by liquid hydrogen***

*Hydrogen fuel cell powering **electric motors***





# ENERGIA H2 GAS TURBINE

35-50 SEATS CAPACITY, 350 TO 500 NM RANGE, EIS BY 2040

**Zero** CO<sub>2</sub> emissions

**60%** lower External Noise



**Dual Fuel Gas Turbine Propulsion**

**100% Hydrogen energy** for short missions

**SAF or JetA option** for reserves and range extension





THANK YOU

