



Catapulting Aviation towards Climate Neutral

The EU's Clean Aviation Programme: Rationale and Overview

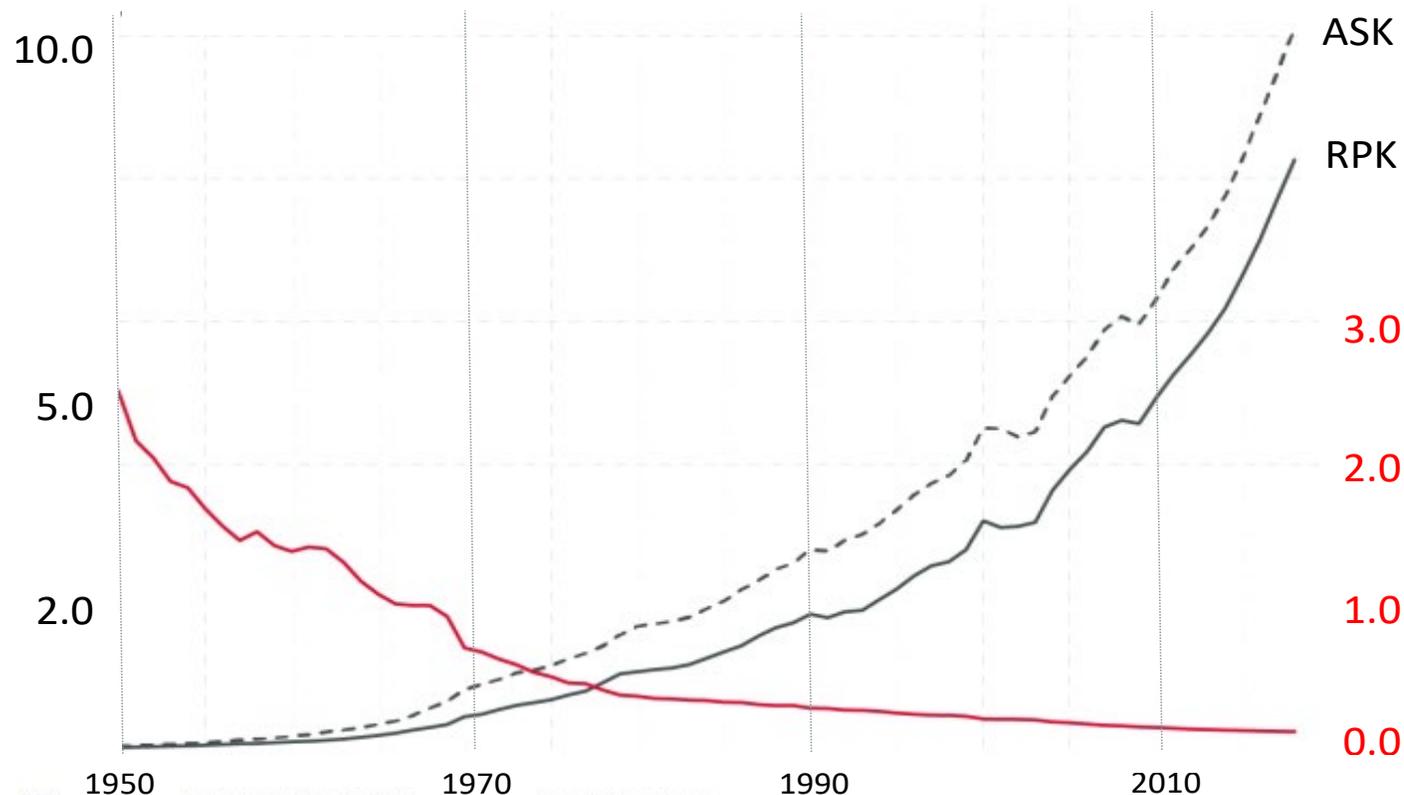
ICAS 2022

Ron van Manen

Head of Strategic Development
Clean Aviation Joint Undertaking

THE CRUX OF THE ISSUE

Seat-km / Passenger-km (10^{12})



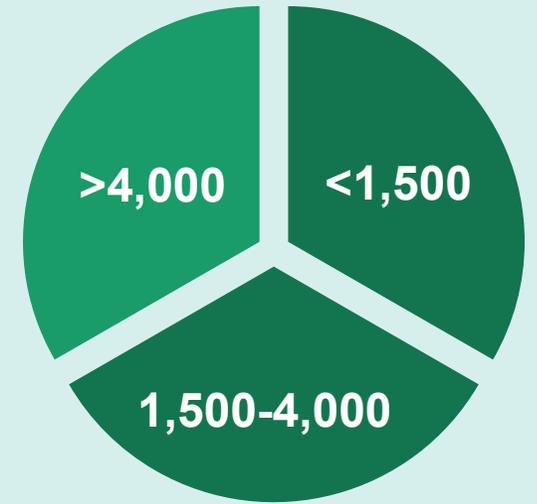
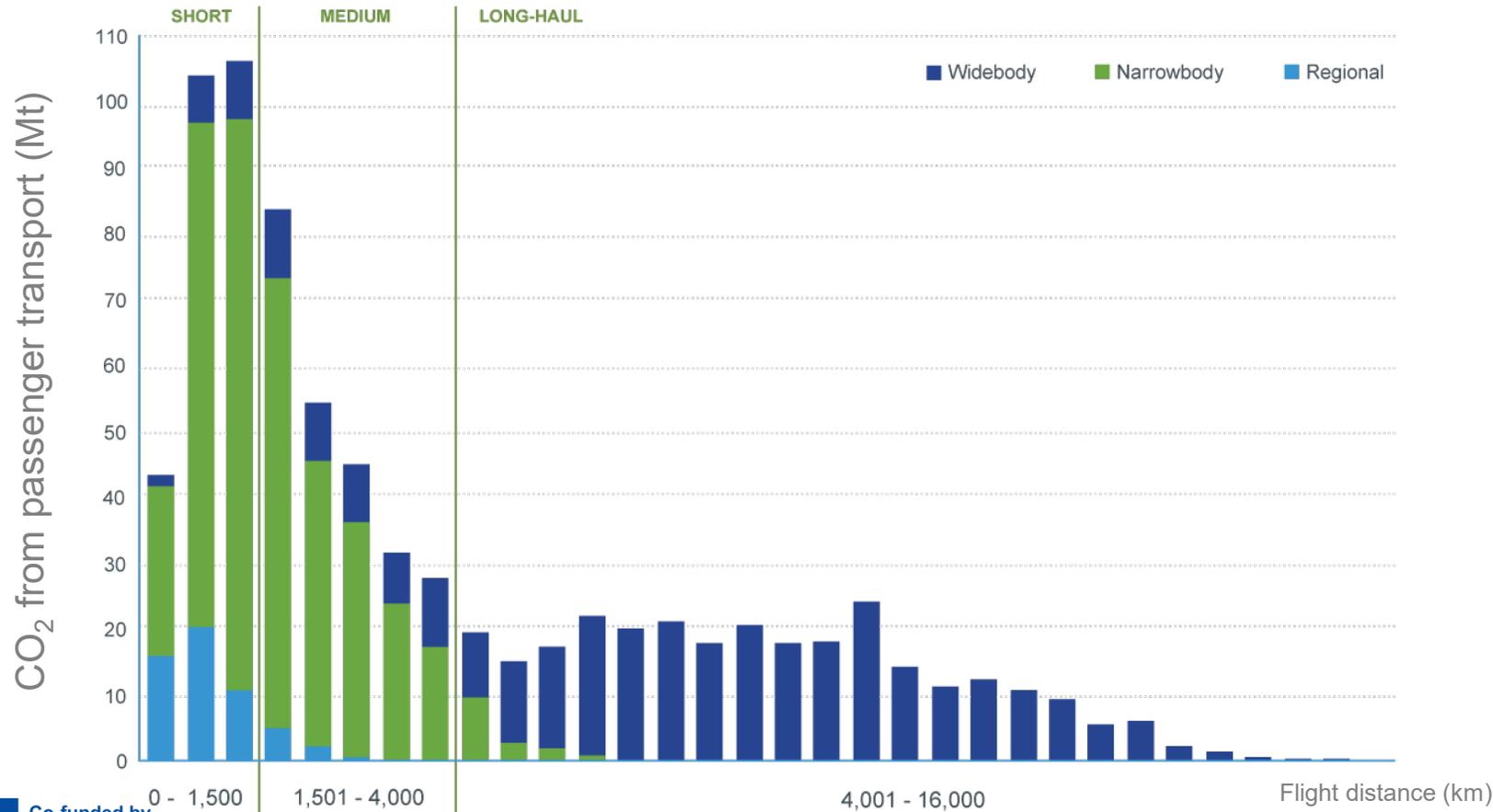
Source and copyright: OurWorldinData.org

Phenomenal progress in efficiency.
But growth has consistently outpaced these gains.

kg CO₂ per RPK

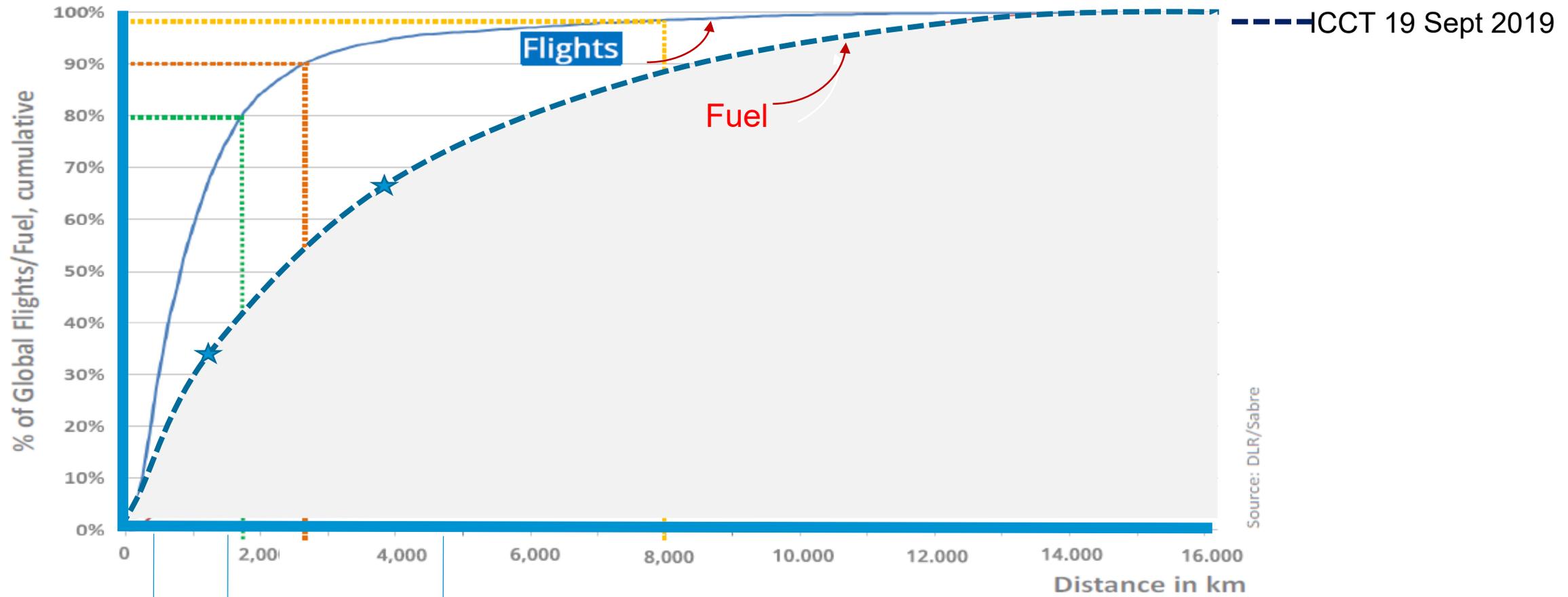
2018: 0.125kg CO₂ per RPK

Share of passenger CO₂ emissions in 2019, by stage length and aircraft class

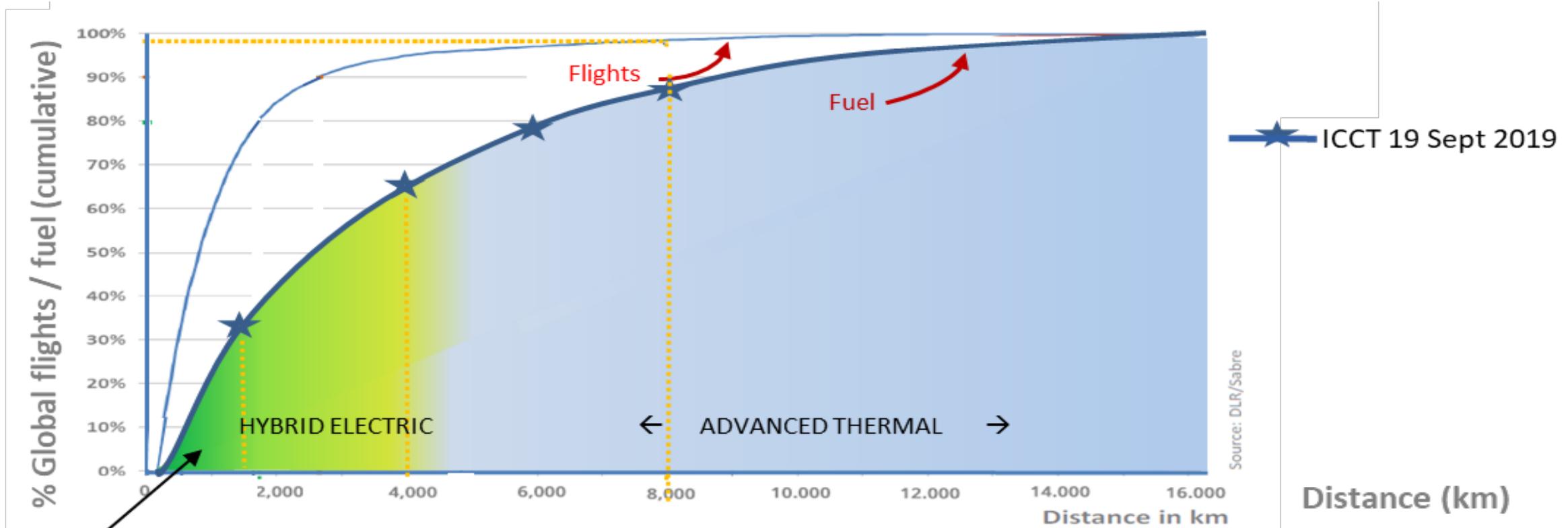


Long term trend:
increase in
 short/medium
 range emissions

WEIGHT OF FLIGHTS AND FUEL CONSUMED

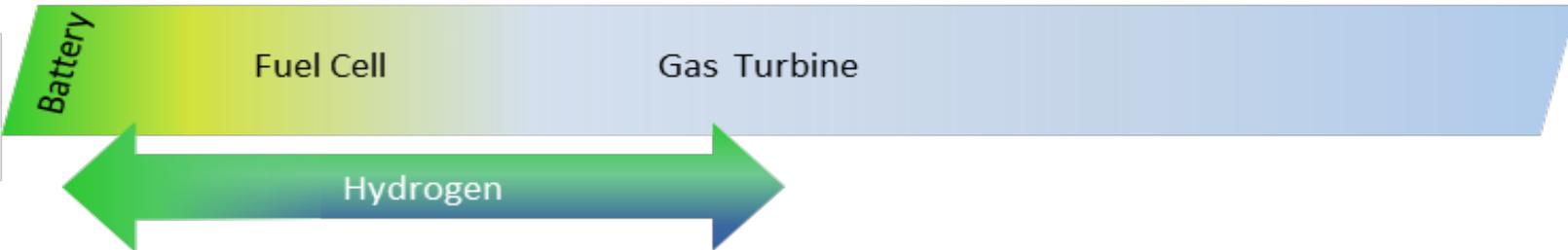


MORE DIFFERENTIATION: SCOPE FOR DISRUPTION



Source: DLR/Sabre

FULL ELECTRIC



Breguet Equation

Energy per unit of fuel mass

Addressing this is the new challenge and highlights the case for H2

$$\text{Range} = \frac{\Delta h_{\text{fuel}}}{g} \eta_{\text{overall}} \frac{L}{D} \ln \left(\frac{W_i}{W_f} \right)$$

Propulsion technology

Structures and materials technology

Flight physics,
aerodynamic efficiency

WHAT IS CLEAN AVIATION?

- **Public Private Partnership** → transformative impact
- **European Green Deal** supporting the **Paris Agreement**
- **Disruptive technology** leveraging new fuel/energy sources
- **Central “hub”** with regional, national + EU programmes



€4.1 bn
Total
Investment

Running
2021-2031

Last Call 2027

- **European Commission**, plus
- **27 Founding Members**
- **12 Associated Members** as of 2022
- **Early 2023** : Further call for additional members

- **Broad membership** providing the key capabilities
- **Open calls**

Technology
delivering 30 to 50%
reduction in GHG
emissions by 2035

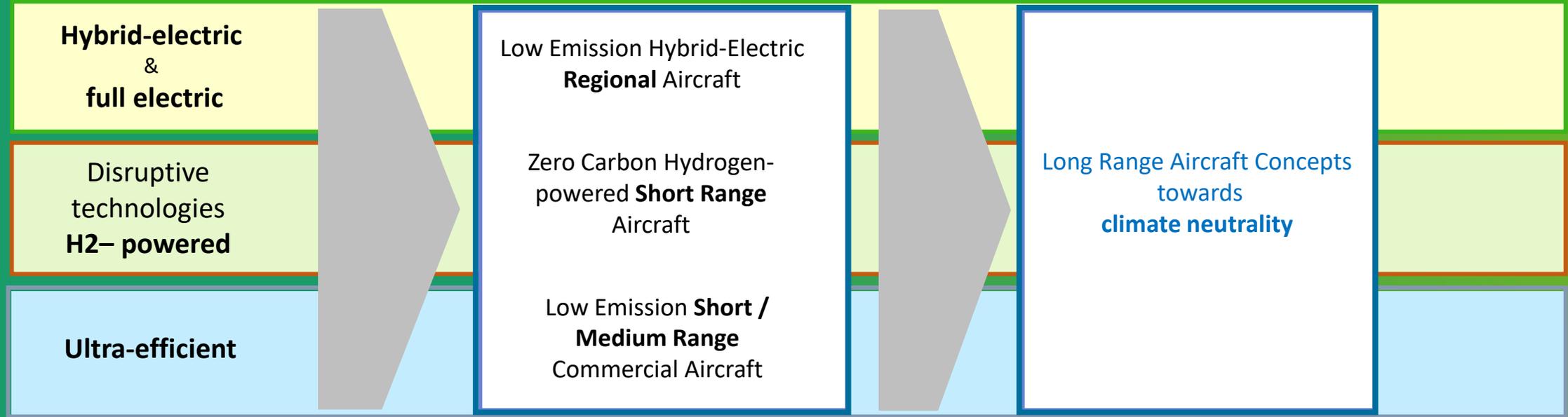
Leveraging new
fuels / energy

Partnering for
maximum impact

The
**MOST
EXCITING
TECHNOLOGICAL
DECADE**
for AERONAUTICS
**IS
BEGINNING**

- »»»»»»»» **Keep pushing the envelope** > ‘traditional’ aeronautical sciences
- »»»»»»»» Non-traditional sciences > **key enablers**
- »»»»»»»» **Replacing ~75% of the global fleet by 2050**
- »»»»»»»» **Simulation, digital twin and innovative certification**
- »»»»»»»» **Life-cycle aspects and recyclability**

CLEAN AVIATION – THREE THRUSTS



Flight demonstration & Impact **by 2035**

Development of disruptive technology options

PROGRAMME SETUP IN A NUTSHELL

EUR 4.1 bn programme
(EU Funding EUR 1.7bn€¹)

Synergies



- Other EU Partnerships & Programmes
 - National/Regional R&I

2022

2025/2026

2030

PHASE I:

Develop concepts, technology options and trade studies

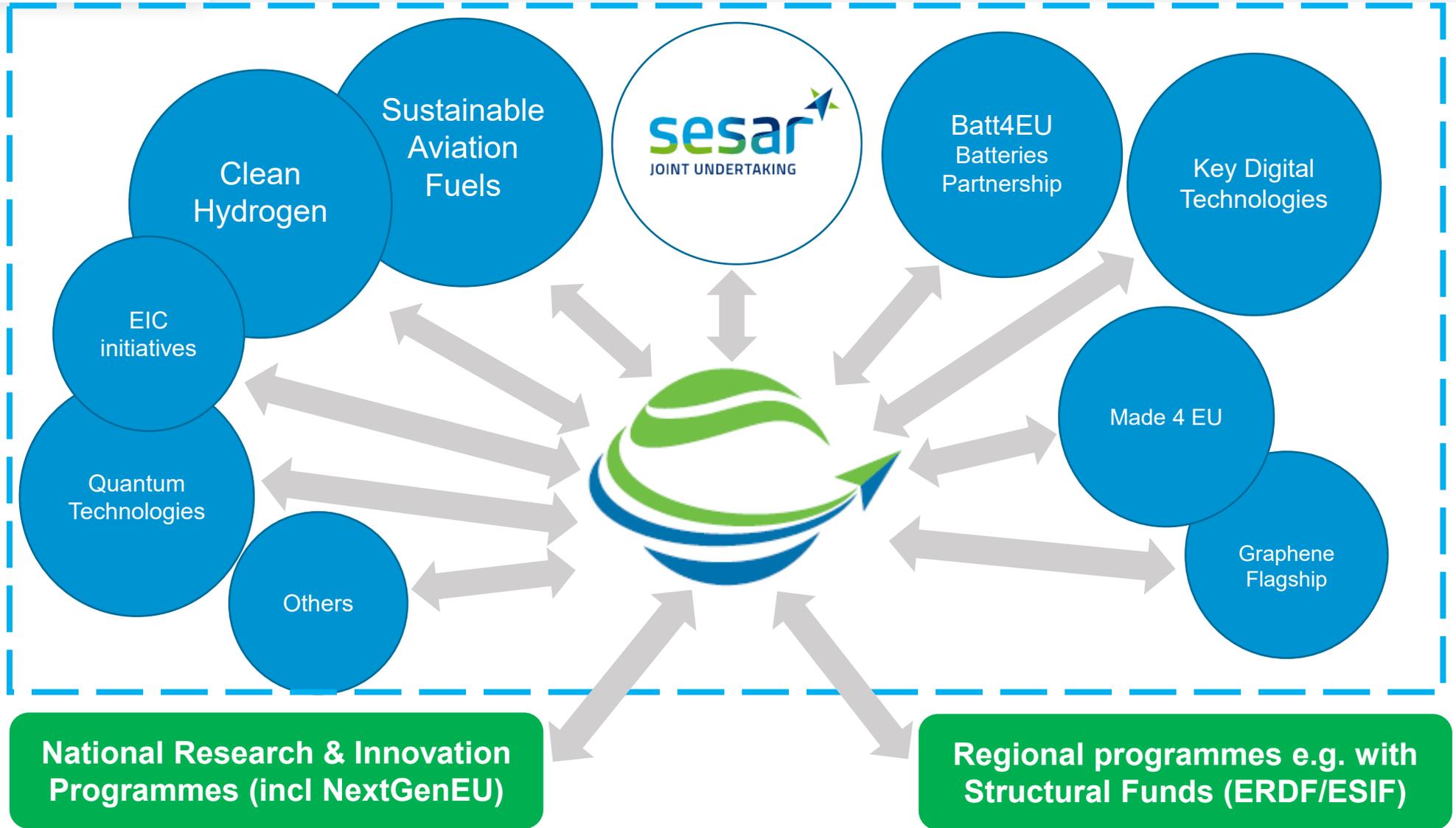
- ~45% of total budget
- Large 1st Call Q1/2022
- CEI for additional members in 2023
- Further 2nd Call Q1/2023

PHASE II:

Mature technology through integrated demonstration

- ~55% of total budget
- Large Call ~Q1/2025
- Further CEI TBD
- Further Calls 2026 up to max. 2027
- Target maturity to enable EIS 2035

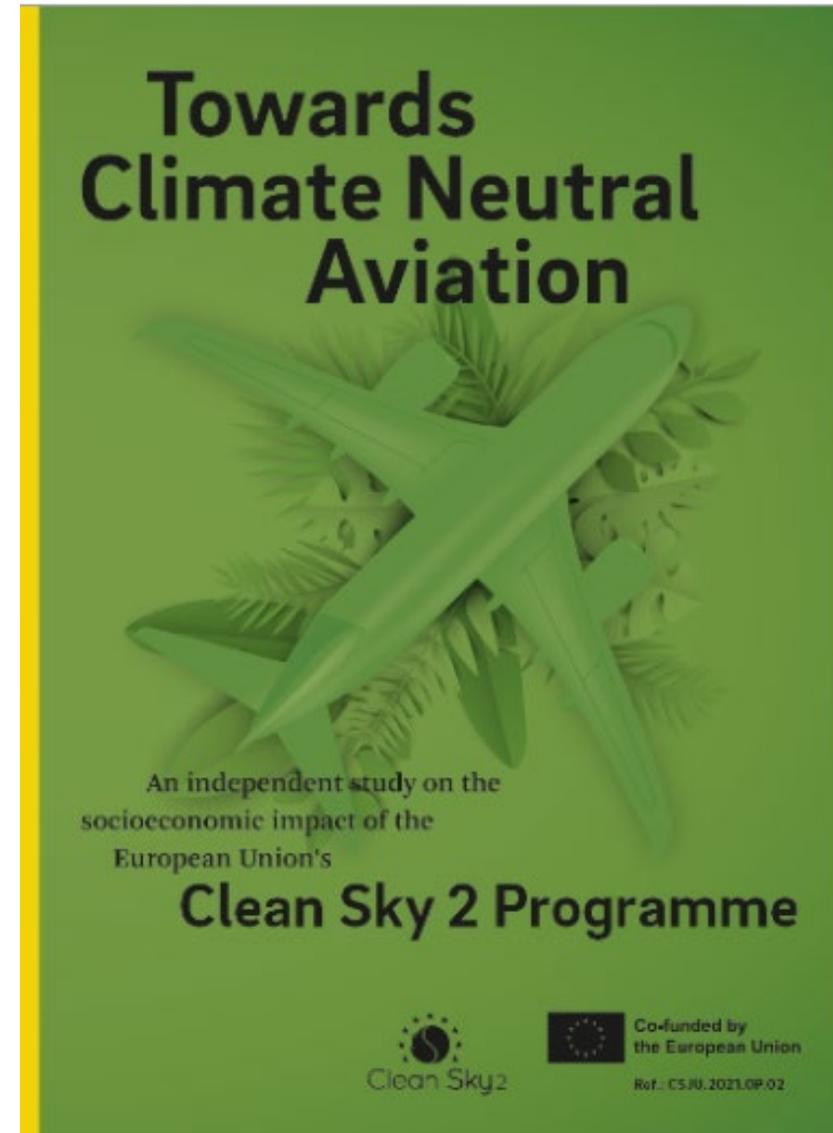
INTEGRATED INNOVATION ARCHITECTURE



“Stress Test”

Independent analysis confirms:
Clean Aviation SRIA **fit for
purpose and essential**

Key recommendations for
transformation towards
Climate-neutral aviation



Further transformation and a systemic approach needed to reach climate neutrality





CLEAN AVIATION



Questions?

EUROPEAN PARTNERSHIP



Co-funded by
the European Union