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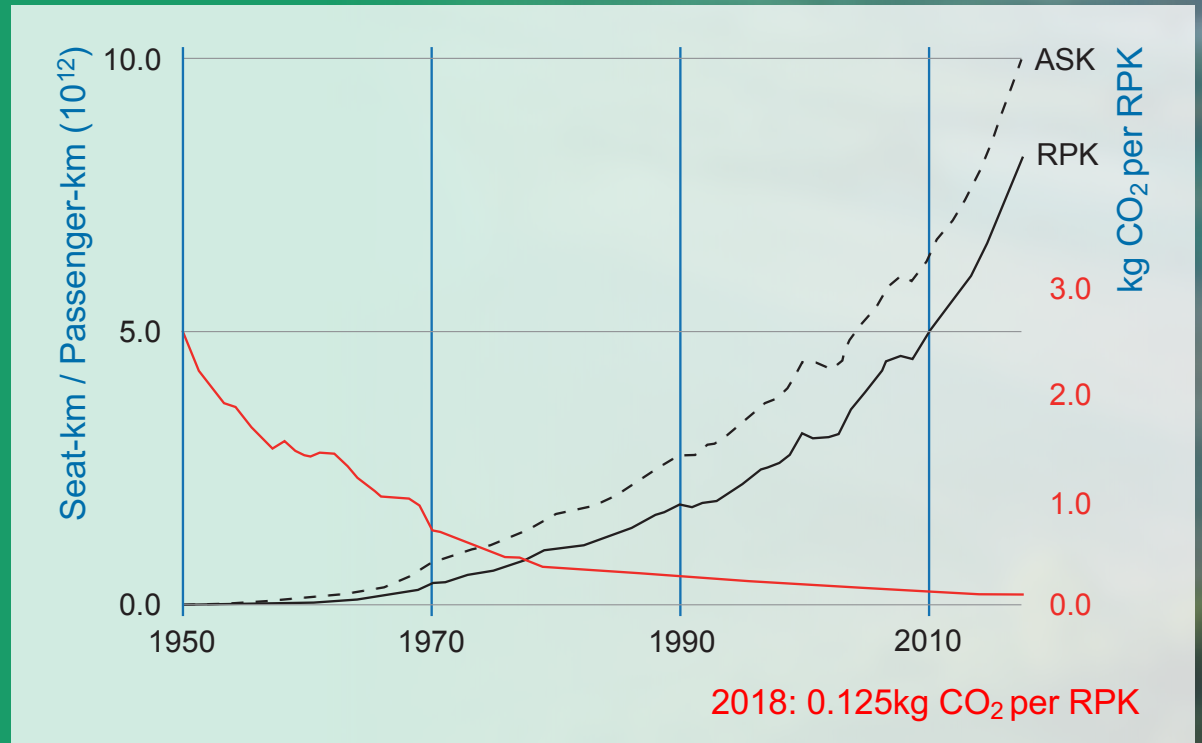


Ron VAN MANEN
Head of Strategy
Clean Aviation JU
Innovair Conference
Stockholm
16 Nov. 2022

Clean Aviation – The EU Public Private Partnership Call 1 results and Call 2 preparation

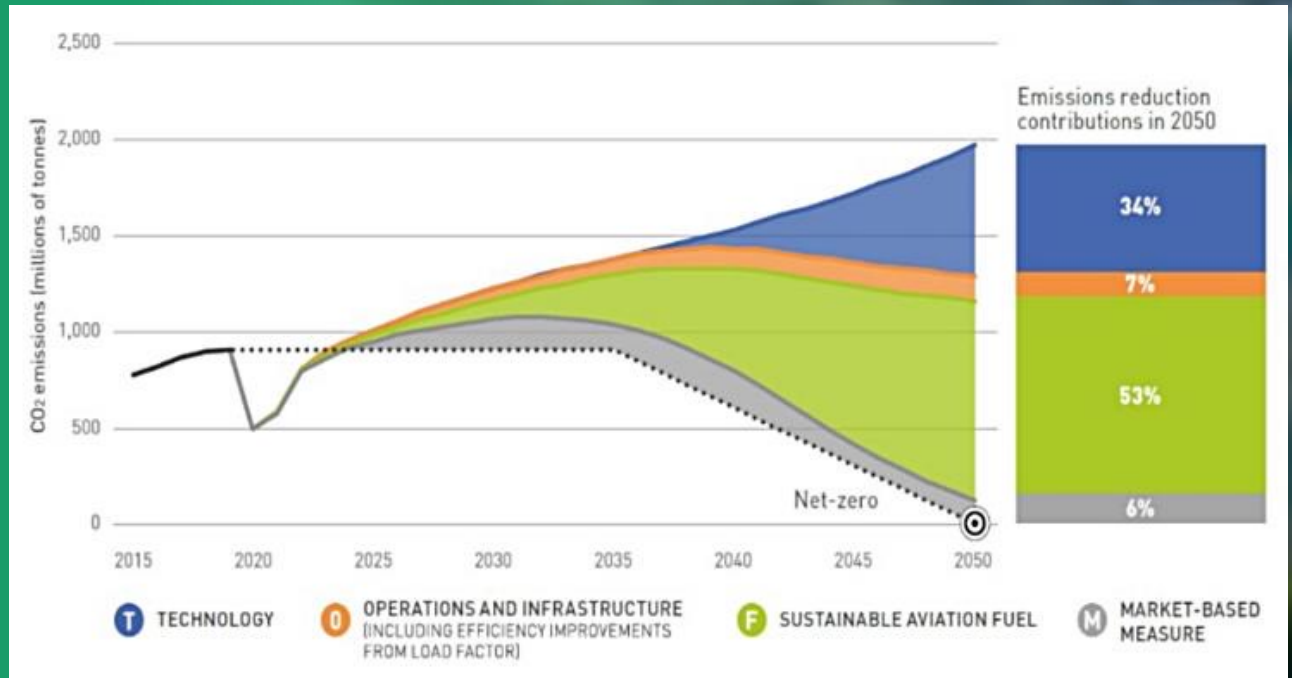
The crux of the issue

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



Towards a climate neutral aviation system

Disruptive
Technology &
Sustainable Aviation
Fuel together will
drive the
transformation



What is clean Aviation?

- **European public-private partnership** funded under Horizon Europe
- Demonstrate **disruptive innovations** by 2030 delivering GHG reductions of > 30% compared to 2020 state-of-the-art aircraft
- Support **2035 EIS** and constituting **75% of the 2050 fleet**
- **EUR 4.1 billion programme** with EU contribution of EUR 1.7 billion



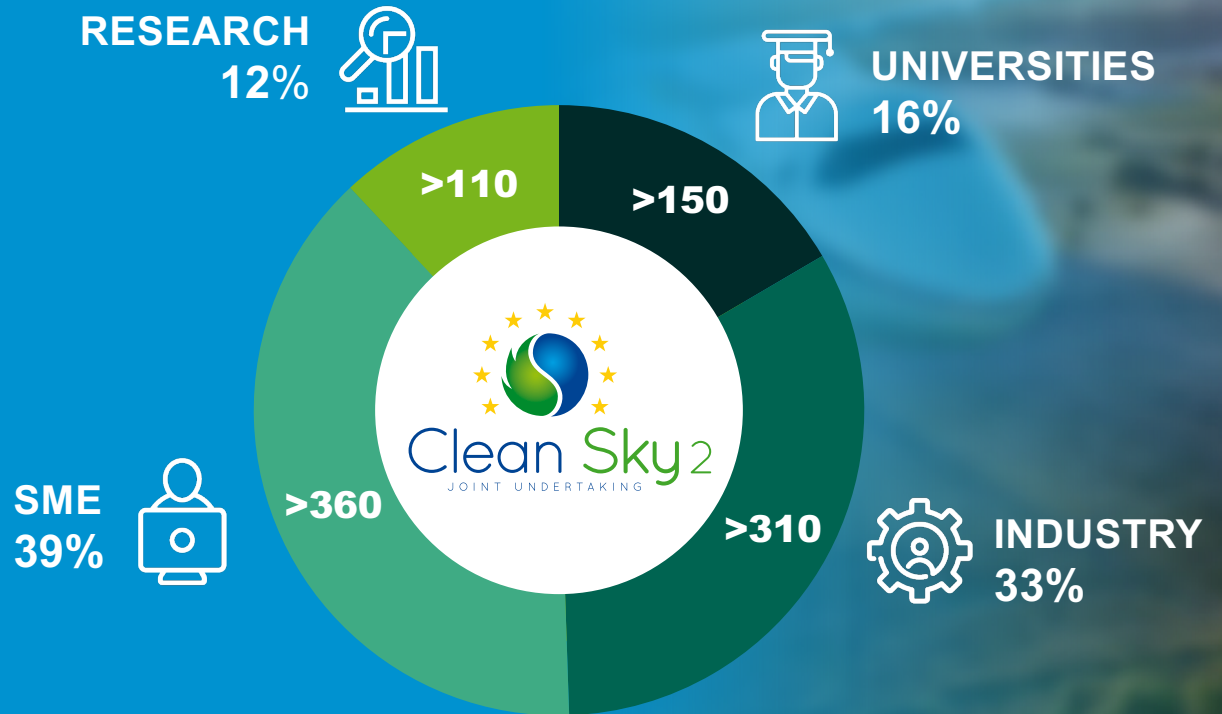
Skip-a-Generation technology leap

- **Keep pushing the envelope in all 'traditional' aeronautical sciences**
- Non-traditional sciences and disciplines will bring **key enablers**
- Manufacturing system
(aim: replacing ~75% of the global fleet by 2050)
- Simulation, digital twin and **innovative certification strategies**
- Full life-cycle aspects and recyclability
- Understand and develop mitigation of all climate warming effects

The **MOST
EXCITING
TECHNOLOGICAL
DECADE** in
AERONAUTICS

Clean Sky 2 – an open and inclusive PPP

An efficient and
high performing
innovation
eco-system



Almost 1000

Total participants

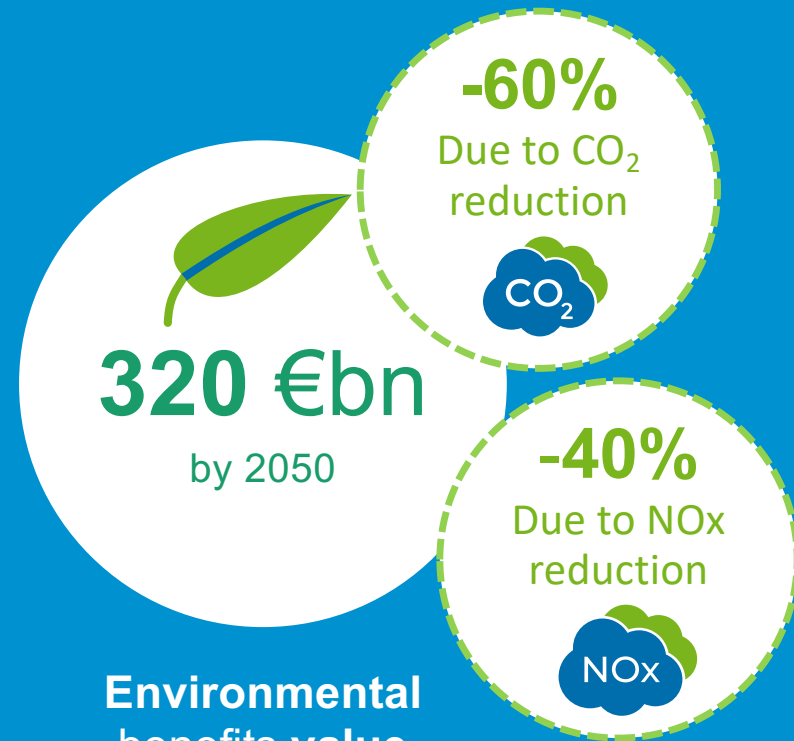
Huge Economic Impact



Massive social &
economic value
to Europe



Research &
Technology:
substantial economic
benefits



Environmental
benefits value



18 Memoranda Of Understanding Across Europe



50 €M

Funding



52

Pilot Projects



12

Clean Sky
Synergy labels

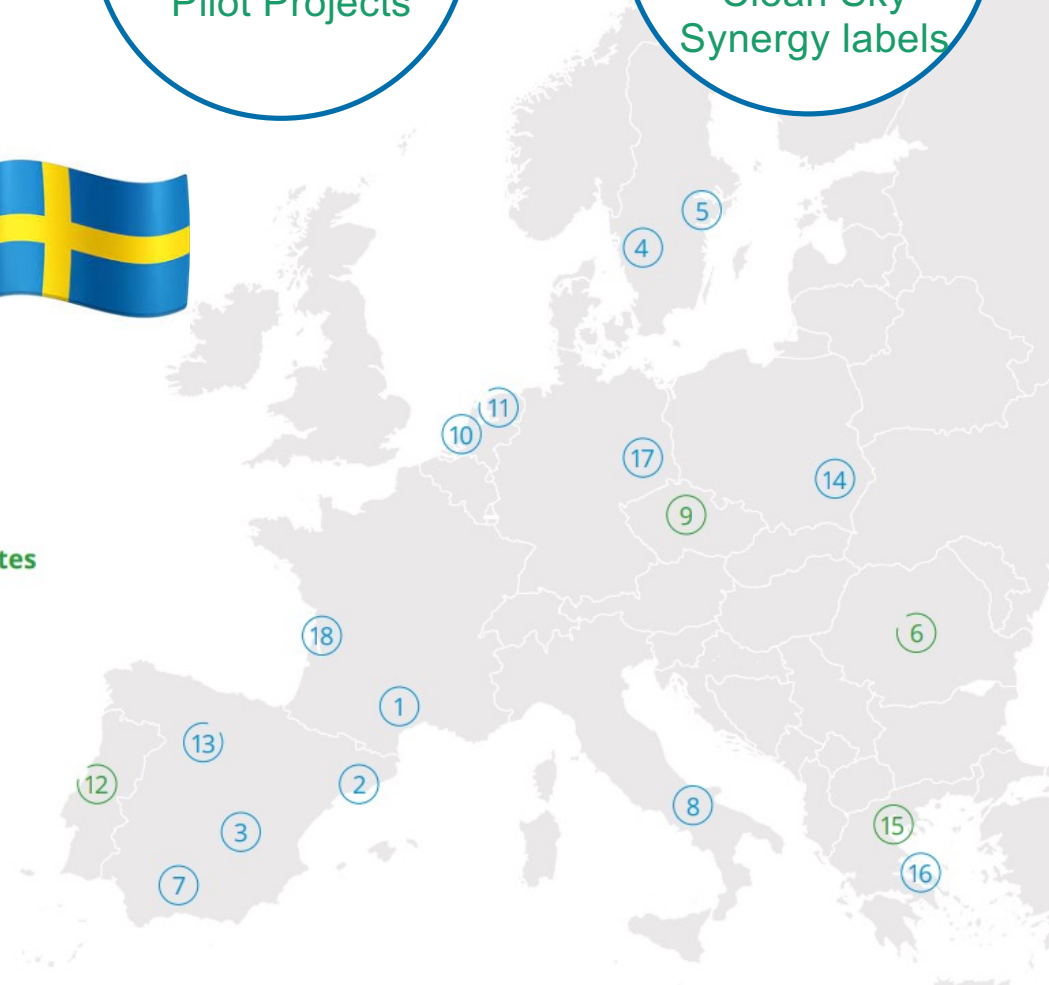
MoUs with regions

1. Occitanie (FR)
2. Catalonia (ES)
3. Castilla-La Mancha (ES)
4. Västra Götaland (SE)
5. Östergötland (SE)
7. Andalucía (ES)
8. Campania (IT)
10. Zuid-Holland (NL)
11. Flevoland (NL)
13. Castilla y León (ES)
14. Podkarpackie (PL)
16. Sterea Ellada (GR)
17. Brandenburg (DE)
18. Nouvelle-Aquitaine (FR)



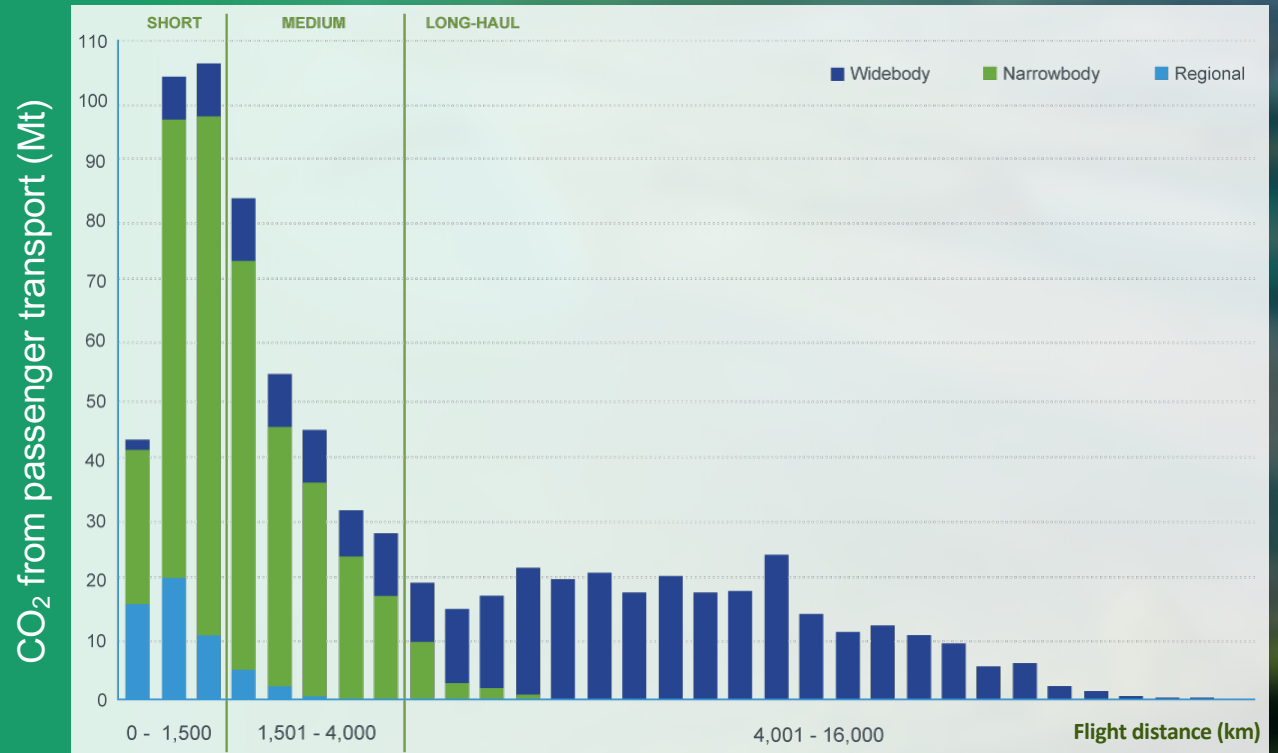
MoUs with Member States

6. Romania
9. Czech Republic
12. Portugal
15. Greece



A closer look at the global aviation system

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



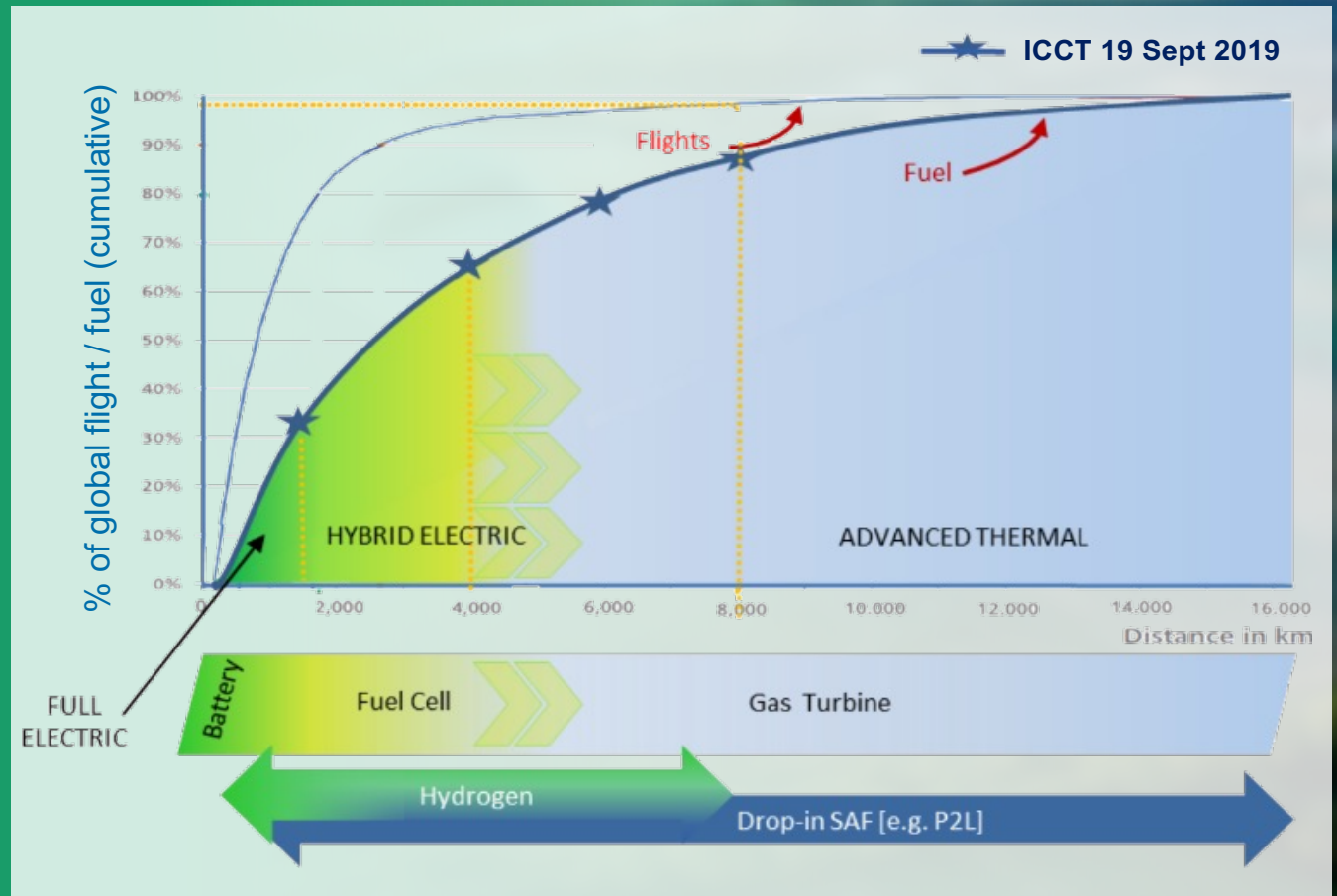
Distribution of emissions by flight distance (in km)

Long term trend shows relative increase in short/medium range emissions



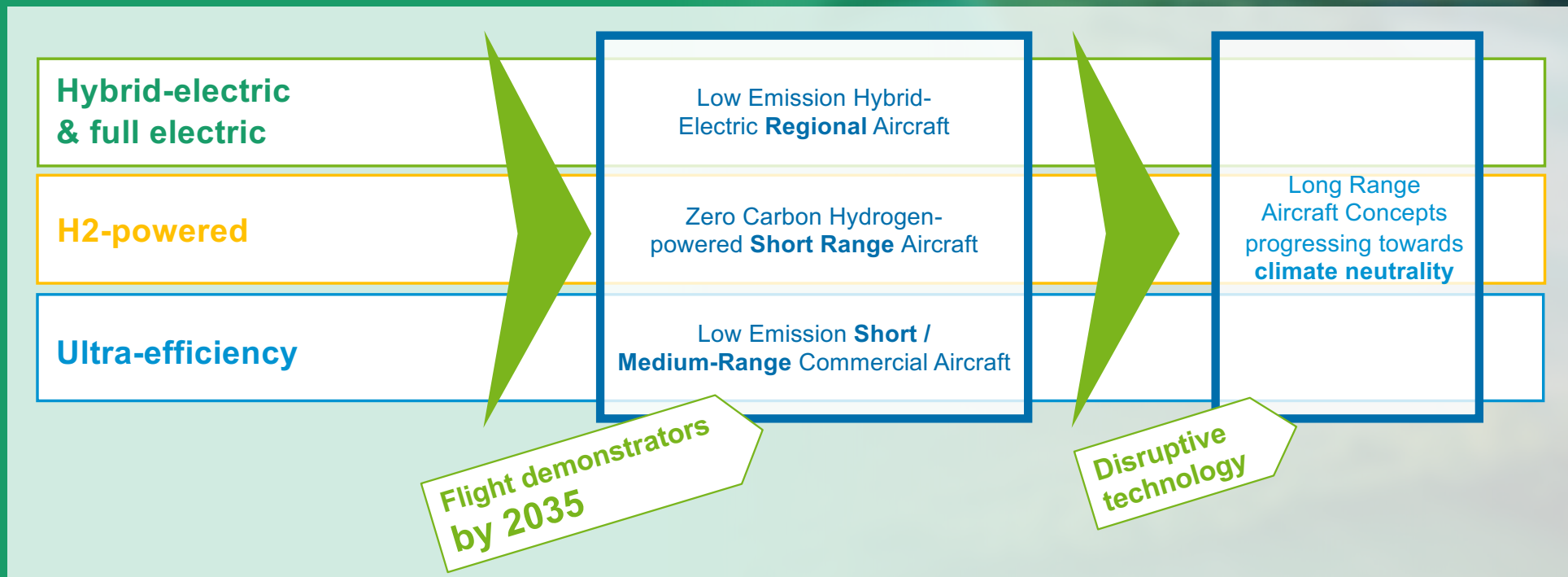
Differentiation: Scope for disruption

Hydrogen powered and (hybrid-) electric will enter the aviation system from lower end. Scalability will determine ultimate share of the system.



Clean Aviation – Three Thrusts

Linchpin in Europe's R&I for the transition



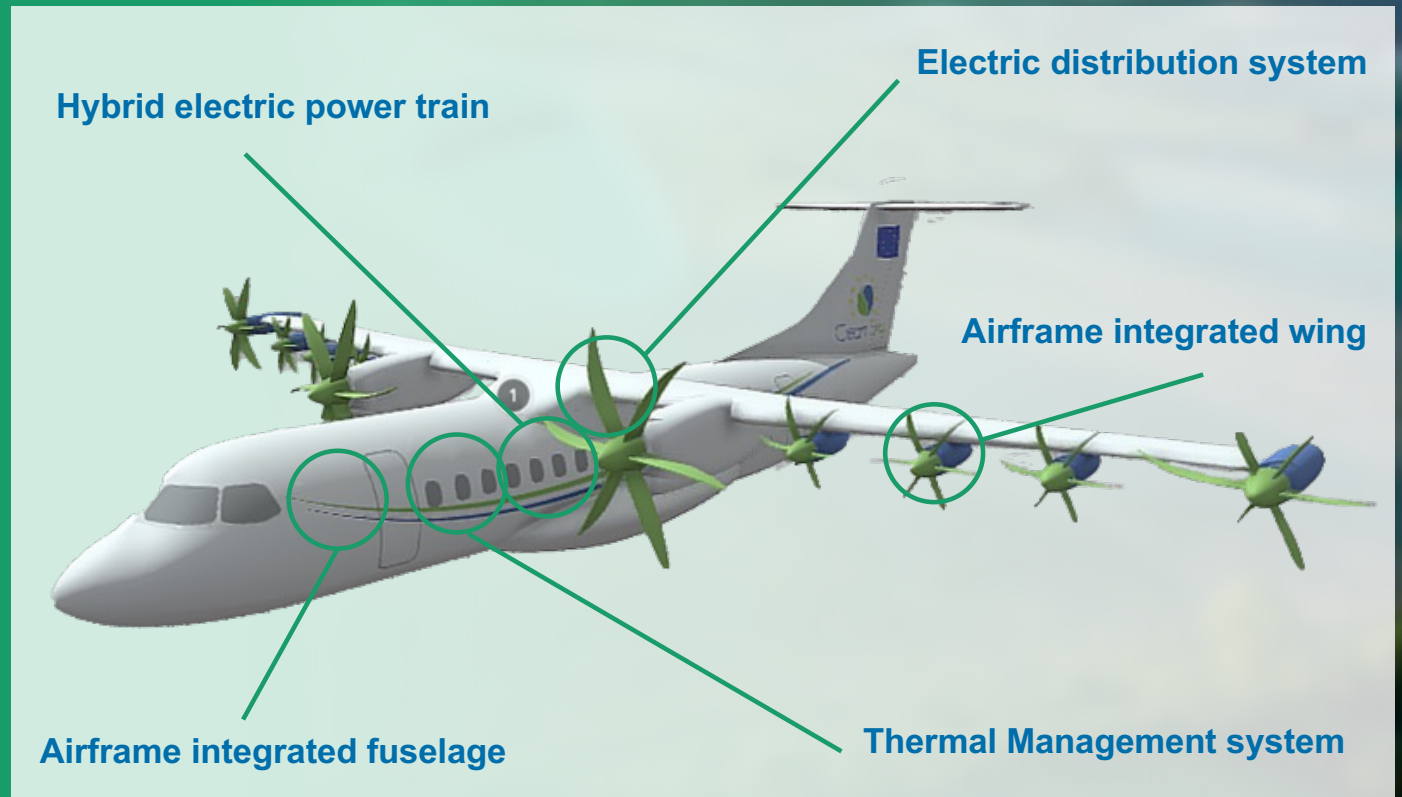
Hybrid & full electric aircraft

>50%

Lower energy /
fuel burn on
typical flight
sector

>90%

Reduction in net-
CO₂ with high-
performance
SAF



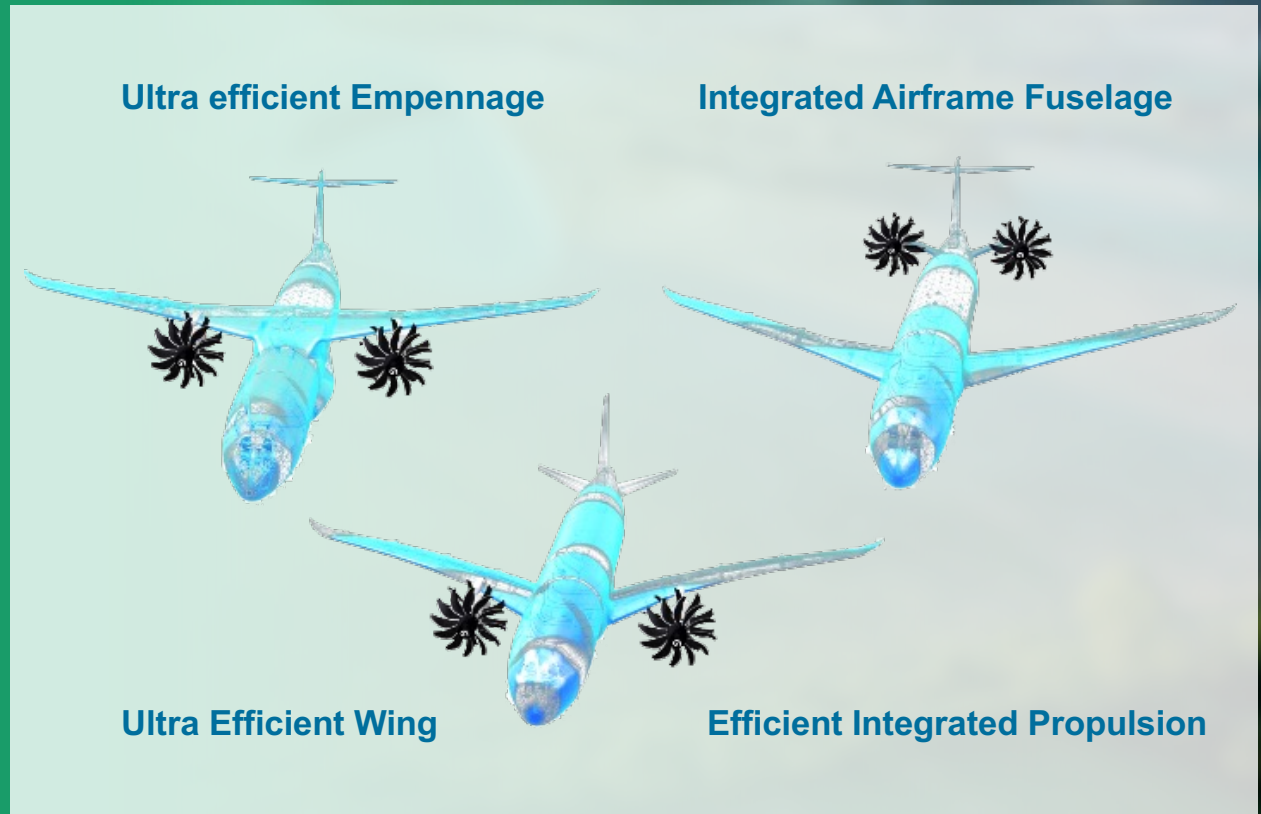
Ultra-efficient short & medium range aircraft

>30%

Lower energy /
fuel burn on
typical flight
sector

>85%

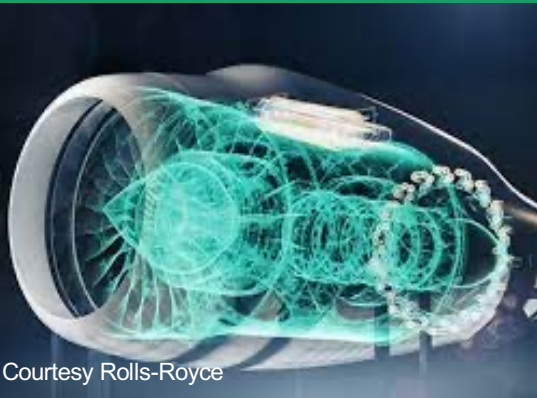
Reduction in net-
CO₂ with high-
performance
SAF



Hydrogen-powered short range aircraft

- True-zero CO₂
- Compelling - but with several major challenges!

DIRECT H₂ COMBUSTION
(GAS TURBINE)



Courtesy Rolls-Royce

MULTI MW FUEL CELL
PROPULSION



LARGE SCALE LIGHT-WEIGHT LH₂
STORAGE



NEAR TERM TECH
DEMONSTRATION



The programme set-up in a nutshell

Maximum Impact in support of the EU Green Deal

EU Funding
1.7bn€¹

Private Funding
>2.4bn€

¹ Revision possible in case of additional associations to Horizon Europe

Synergies



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

2022

2025/2026

2028

2030

PHASE I:

Develop concepts, technology options and trade studies

PHASE II:

Accelerate technology maturation through integrated demonstration

- ~45% of total budget
- Large 'big bang' 1st Call Q1/2022
- CEI for additional members in 2023
- Smaller 2nd Call Q1/2023; 3rd in Q1/2024
- Configuration of PHASE II to emerge by Q4/2024

- ~55% of total budget
- Large Call ~Q1/2025 (project launch w/in 2025)
- CEI TBD for demo prep/build phase
- Further (modest) Calls 2026 - 2027
- Target maturity to enable EIS 2035



~655 m€
EU funding

Starting in 2022 Clean Aviation's daring new projects

	PROJECT TITLE	PROJECT COORDINATOR	PROJECT TOPIC*
HYBRID ELECTRIC POWERED AIRCRAFT	HE-ART	ROLLS-ROYCE DEUTSCHLAND LTD & CO KG	Multi-MW Hybrid-Electric Propulsion System
	AMBER	GE AVIO SRL	
	TheMa4HERA	HONEYWELL INTERNATIONAL SRO	Thermal Management Solutions
	HECATE	COLLINS AEROSPACE IRELAND, LIMITED	Electrical Distribution Solutions
	HERWINGT	AIRBUS DEFENCE AND SPACE SA	Innovative Wing Design
HYDROGEN POWERED AIRCRAFT	CAVENDISH	ROLLS-ROYCE PLC	Direct Combustion of Hydrogen in Aero-engines
	HYDEA	GE AVIO SRL	
	NEWBORN	HONEYWELL INTERNATIONAL SRO	Multi-MW Fuel Cell Propulsion System
	H2ELIOS	ACITURRI ENGINEERING SL	Large Scale Lightweight Liquid Hydrogen Integral Storage Solutions
	flHYing tank	PIPISTREL VERTICAL SOLUTIONS DOO PODJETJE ZA NAPREDNE LETALSKE RESITVE	
	HyPoTraDe	PIPISTREL VERTICAL SOLUTIONS DOO PODJETJE ZA NAPREDNE LETALSKE RESITVE	Near Term Disruptive Technologies
ULTRA EFFICIENT SHORT & MEDIUM RANGE AIRCRAFT	OFELIA	SAFRAN AIRCRAFT ENGINES	Ultra Efficient Propulsion Systems
	SWITCH	MTU AERO ENGINES AG	
	HEAVEN	ROLLS-ROYCE PLC	Ultra Performance Wing
	UP Wing	AIRBUS OPERATIONS GMBH	
	FASTER-H2	AIRBUS OPERATIONS GMBH	Advanced Low Weight Integrated Fuselage and Empennage
TRANSVERSAL AREAS	HERA	LEONARDO - SOCIETA PER AZIONI	Aircraft concepts enabling 30 to 50% reduction in emissions
	SMR ACAP	AIRBUS OPERATIONS GMBH	
	CONCERTO	DASSAULT AVIATION	Novel Certification Methods and Means of Compliance for Disruptive Technologies
	ECARE	AEROSPACE VALLEY	Developing a European Clean Aviation Regional Ecosystem (ECARE)

* Official launch of projects is still subject to legal redress and to successful completion of grant preparation

CALL 2 TOPICS UNDER DISCUSSION

~153 m€
EU funding

Target launch date
Feb 2023

Hydrogen Powered AC topics

Liquid Hydrogen Fuel Distribution Technologies

H2 Direct Burn Combustion

Fuel Cell Propulsion System

Hybrid Electric Regional AC topics

Innovative HER Fuselage/Empennage

Digitalisation of the HER Design Process

HER Nacelle

Short and Medium Range AC topics

Disruptive SMR propulsion

SMR+ Wing

Cabin / fuselage systems

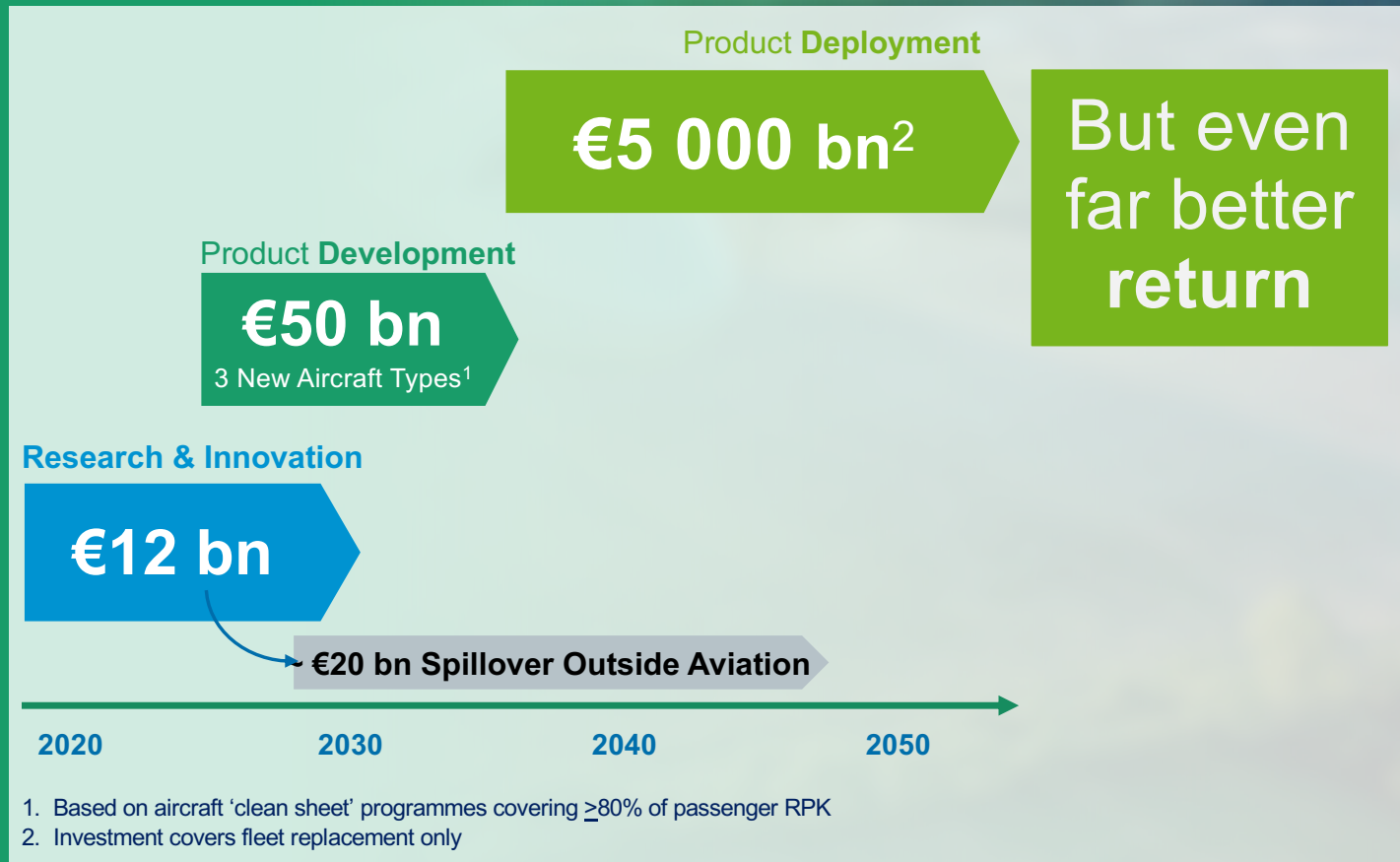
Sustainable Industrialisation (including LCA)



Integrated innovation architecture



Huge R&I challenge, massive investment



1. Based on aircraft 'clean sheet' programmes covering $\geq 80\%$ of passenger RPK
2. Investment covers fleet replacement only

Further transformation and a systemic approach needed to reach climate neutrality





CLEAN AVIATION



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| Thank you