

Innovation Fund Stakeholder Consultation event

13 June 2023 - In person and online

Break time 11:10 – 11:30 CEST

Next session – workshops:

- Industry decarbonisation, including substitute products → Room 0D (ground floor)
- Aviation → Room 4B (fourth floor)

Please note the event is livestreamed and recorded.





Innovation Fund and the aviation sector

*Innovation Fund Stakeholders event
DG CLIMA.B4*

13 June 2023

Aviation emissions – why do they matter?



- Total climate impacts of intra-European flights: 136-272m tonnes CO₂-equivalent (2019)
- Climate impacts from aviation exceed the cumulative emissions of >150 countries.
- Long-haul flights are responsible for >60% of total emissions.
 - A person flying Lisbon-New York return = an average person in the EU heating their home for a year.

Revision of the EU ETS



The EU reached a political agreement about the revision of the ETS Aviation Directive on 6 December 2022. The European Parliament adopted the agreed text with great majority on 18 April 2023 and the Council on 25 April 2023. **The date of effect is 6 June 2023.**

Key outcomes

- **CORSIA implementation as appropriate:** EU ETS for intra-European flights (including to UK and CH), CORSIA for extra-European. Review in 2026 to evaluate the ambition of CORSIA and extend EU ETS scope to departing flights in case it is not ambitious enough or participation is limited.
- **Gradual phase-out of free allocation**
- **ETS-financed support for Sustainable Aviation Fuels**
- Monitoring and reporting of **non-CO₂ effects** as from 2025

Revision of the EU ETS

Use of revenues



- Direct support for alternative fuels: **20 million ETS allowances** reserved to **covering some or all of the price gap** between conventional fossil fuel and sustainable aviation fuels, to accelerate deployment of alternative fuels
- All Member States revenues resulting from auctions **shall** be used to tackle climate change
- **5 million allowances** added to the ETS Innovation Fund, for which airlines and airports have always been eligible for support
- **EU ETS Innovation Fund** expansion to support the **electrification** of aviation and to address reductions of aviation's **full climate impact** (2-4 times CO₂ alone)

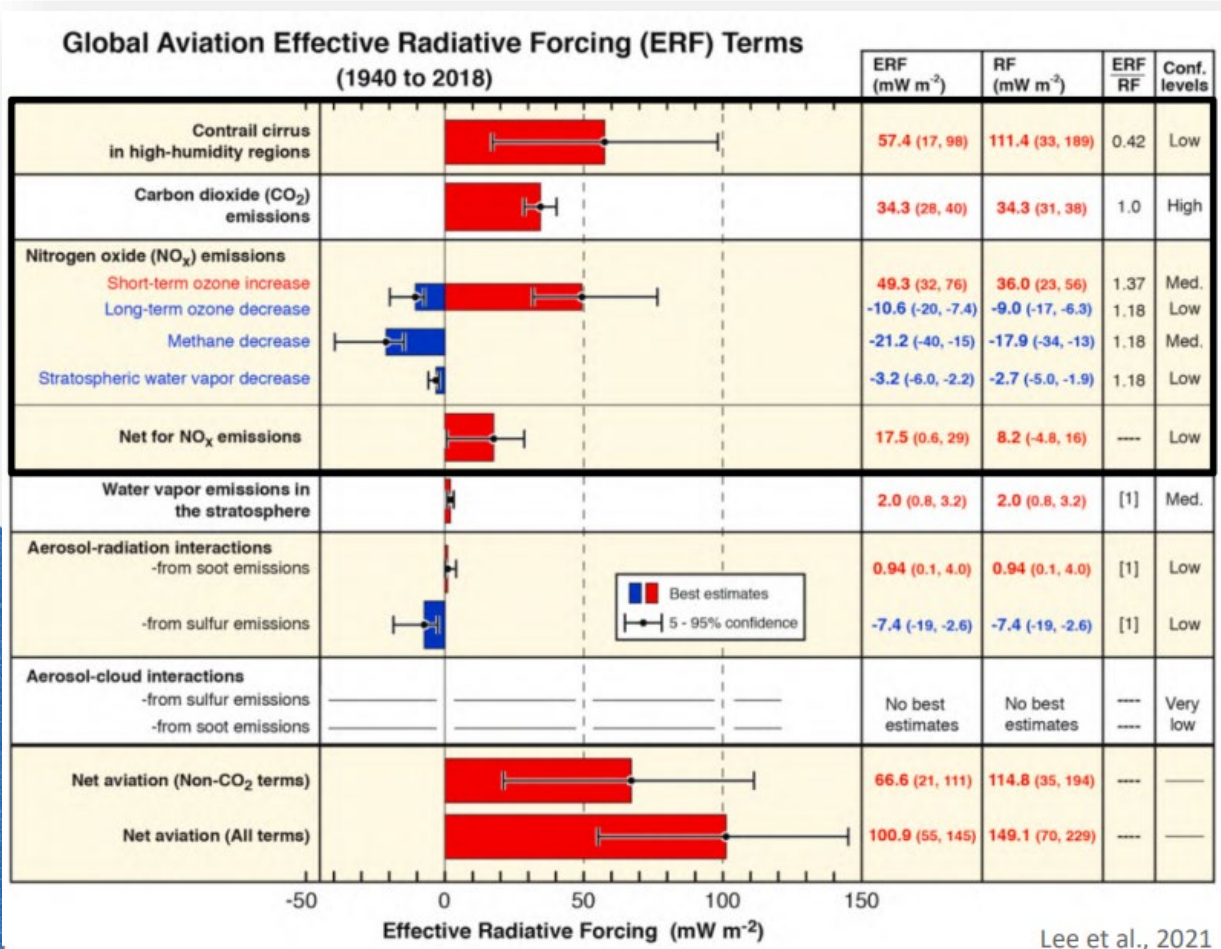
Revision of the EU ETS

Non-CO₂ climate effects

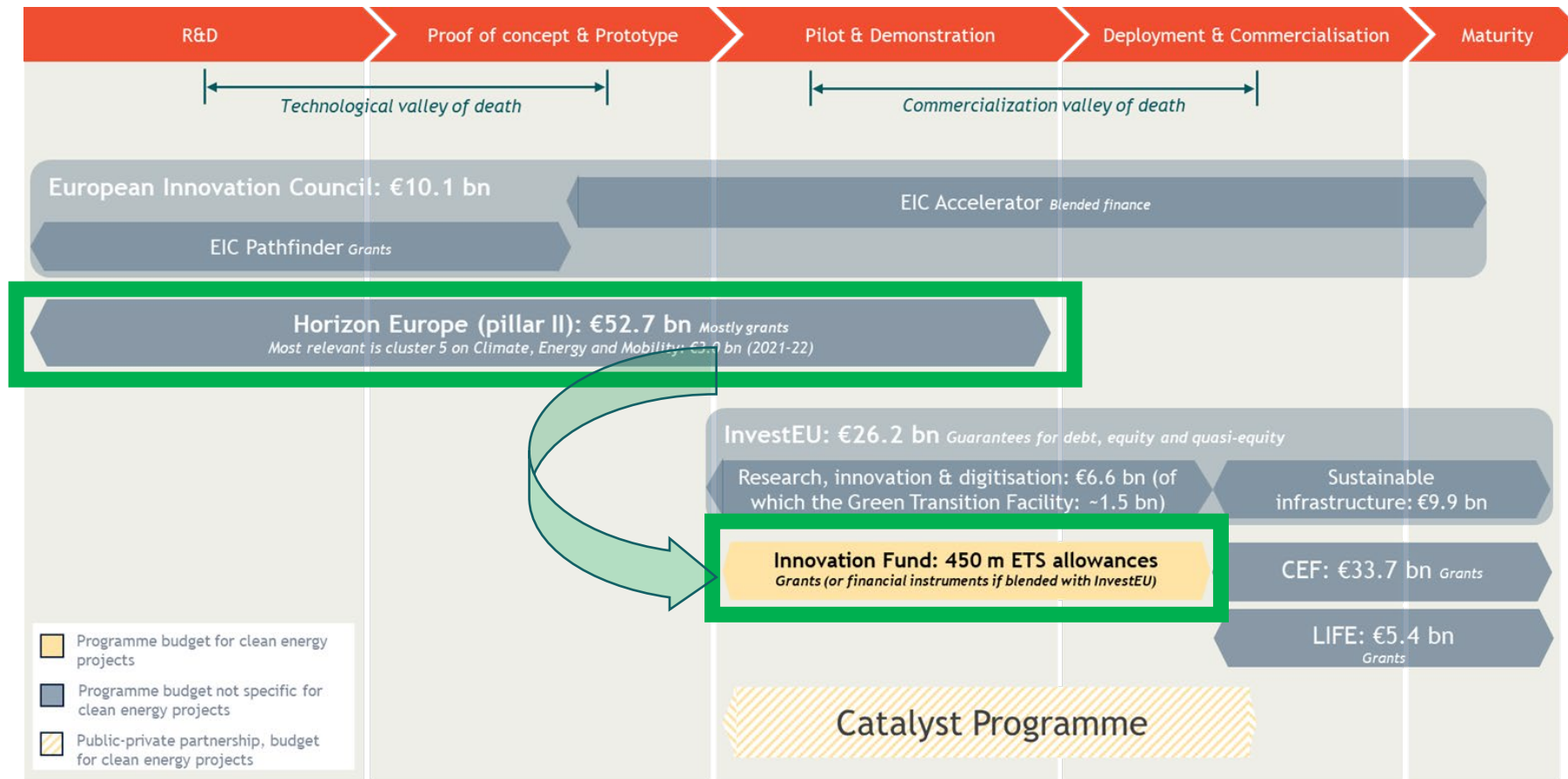
- The main climate effects from aviation come from:

- CO₂
- contrail cirrus clouds
- The 'net NO_x' effect
- Contributions from water vapour, soot and sulphur aerosol-radiation interactions

- Non-CO₂ impacts represent ~2/3rd (66%) of net Effective Radiative Forcing (CO₂ ~34% share)



EU funding and financing instruments for clean energy (2021-2027)



Adapted from
Trinomics

THE EU RESEARCH&INNOVATION PROGRAMME 2021–27



HORIZON EUROPE

EURATOM

SPECIFIC PROGRAMME: EUROPEAN DEFENCE FUND

Exclusive focus on defence research & development

SPECIFIC PROGRAMME IMPLEMENTING HORIZON EUROPE & EIT*

Exclusive focus on civil applications



Pillar I
EXCELLENT SCIENCE

European Research Council



Pillar II
GLOBAL CHALLENGES & EUROPEAN INDUSTRIAL COMPETITIVENESS

- Clusters
- Health
 - Culture, Creativity & Inclusive Society
 - Civil Security for Society
 - Digital, Industry & Space
 - Climate, Energy & Mobility
 - Food, Bioeconomy, Natural Resources, Agriculture & Environment

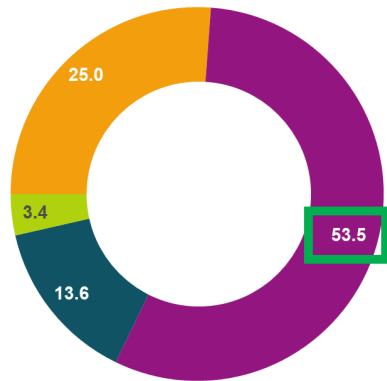
Joint Research Centre



Pillar III
INNOVATIVE EUROPE

European Innovation Council

Fusion



Political agreement December 2020
€ billion in current prices

- Excellent Science
- Global challenges and European ind. comp.
- Innovative Europe
- Widening Part and ERA

in current prices

Cluster 1	Health	€8.246 billion (including €1.35 billion from NGEU)
Cluster 2	Culture, Creativity & Inclusive Societies	€2.280 billion
Cluster 3	Civil Security for Society	€1.596 billion
Cluster 4	Digital, Industry & Space	€15.349 billion (including €1.35 billion from NGEU)
Cluster 5	Climate, Energy & Mobility	€15.123 billion (including €1.35 billion from NGEU)
Cluster 6	Food, Bioeconomy, Natural Resources, Agriculture & Environment	€8.952 billion
	JRC (non-nuclear direct actions)	€1.970 billion

Clusters are including a budget for Partnerships and Missions
NGEU is Next Generation EU programme – Recovery Fund

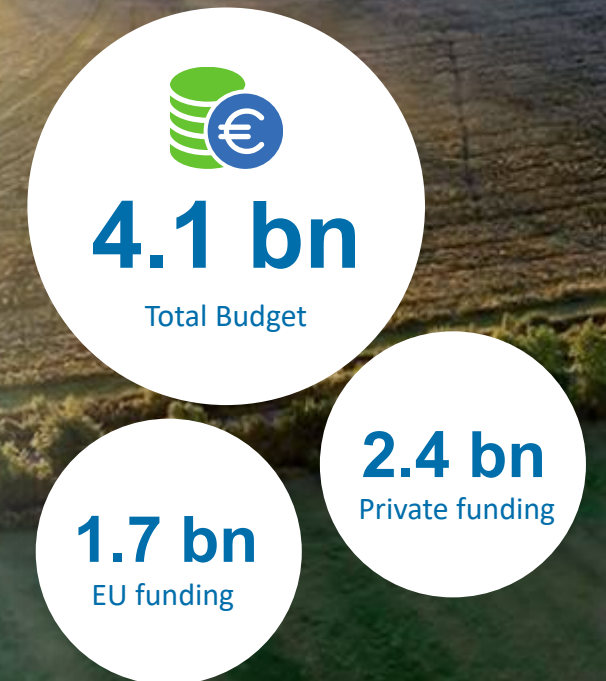
Widening participation & spreading excellence

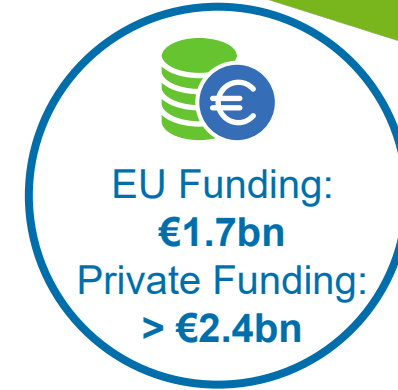
Reforming & Enhancing

* The European Institute of Innovation & Technology (EIT) is not part of the Specific Programme

The leading European R&I Programme towards climate-neutral aviation

- European Public Private Partnership
- Impact-driven programme
- Reducing net greenhouse gases (vs 2020):
 - 30% for Short-Medium Range Aircraft
 - 50% for Regional Aircraft
- Entry Into Service of aircraft technologies \leq 2035

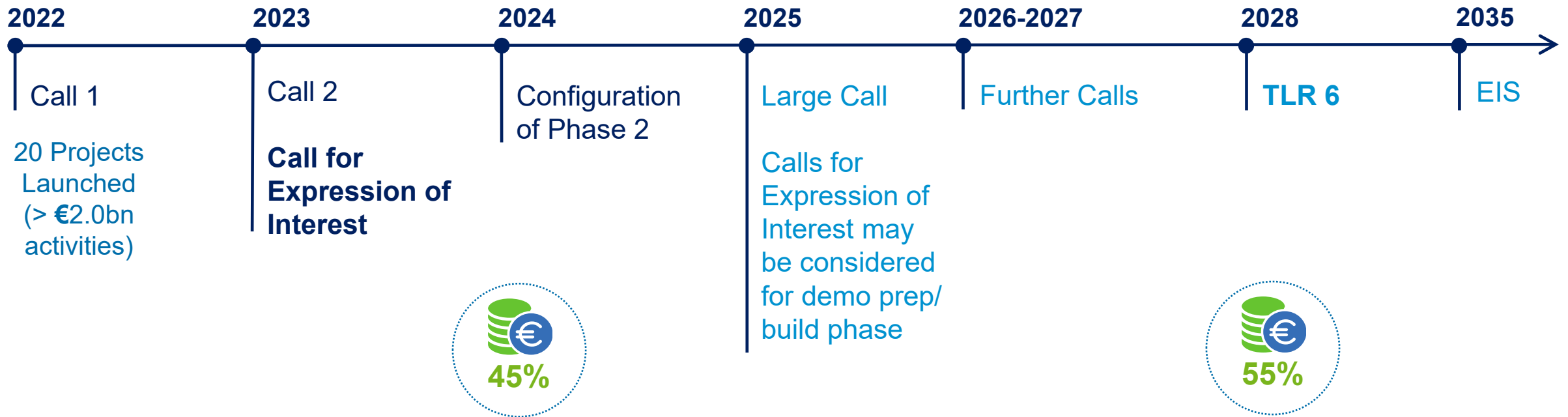




Clean Aviation: 2 Phases

Phase 1: Develop concepts, technology options and trade studies

Phase 2: Accelerate technology maturation through integrated demonstration



Driving
Efficiency
&
Emission
Reduction

Clean Aviation: 3 thrusts

Phase 1: Develop concepts, technology options and trade studies



TRANSVERSAL AREAS

Clean Sky 2 Achievements (1 / 2)



Clean Sky 2
Test bed 2
Maiden flight



Tech
Turboprop
Engine



Racer
FRC

Clean Sky 2 Achievements (2 / 2)

Ultra High
Propulsive
Efficiency



MultiFunctional
Fuselage
Demonstrator



UltraFan
Engine



| Suggested Areas of IF intervention

Large investments needed for

- Large scale demonstration of CS2 / CA technologies
- Airport infrastructures to operate SAF / hybrid-electric / H2-powered aircraft

SESAR 3 JU – Delivering Digital European Sky



Accelerate through research & innovation the delivery of an inclusive, resilient & sustainable Digital European Sky



50+ founding members representing entire aviation value chain (incl. new entrants)



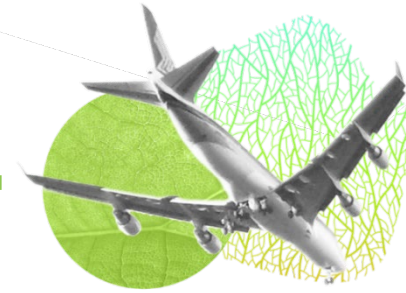
- Horizon Europe - EUR 600 million
- Eurocontrol – EUR 500 million (in-kind & financial contributions)
- Industry - EUR 500 million minimum (in-kind & financial contributions)

Additional funds via the Connecting Europe Facility (in coordination with CINEA)



Take part in
the
Digital
European
Sky
Visit sesarju.eu
for more information

Delivering results and preparing for...



70 projects completed bringing to a close **SESAR 2020**



127 solutions delivered for implementation



59 more solutions in the innovation pipeline



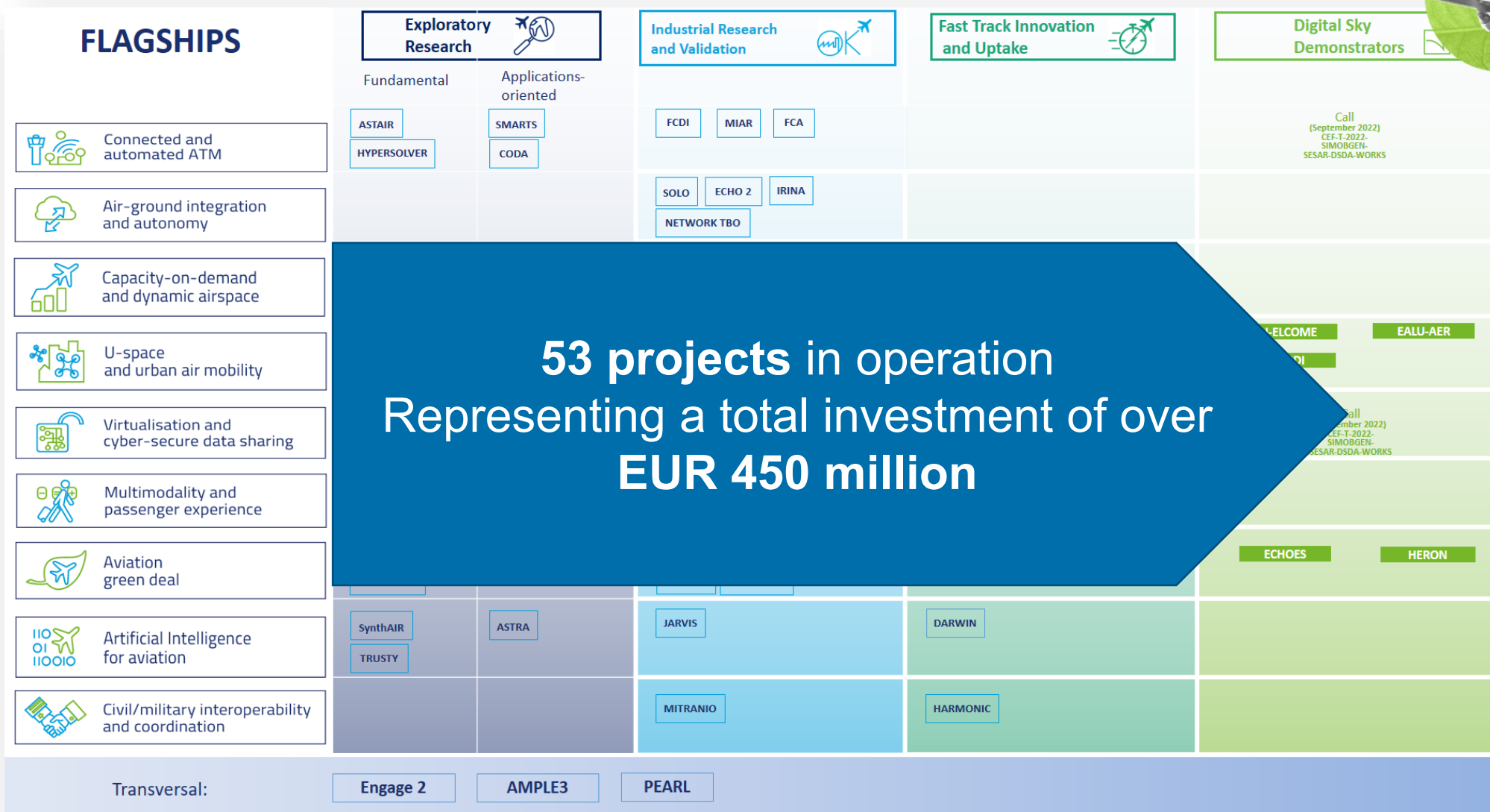
More on the horizon with **SESAR 3 JU**



53 new projects running in **2023** covering **all strands of research**



SESAR3 - Project Landscape



SESAR3 & Sustainability



Supporting net zero aviation

Connected and contributing to strategy on net-zero policy for aviation at ICAO and European levels;

Digital European Sky programme has dedicated flagships on environment, focusing on reducing CO2 and non-CO2 emissions;

Very large-scale demonstrators focusing on quick wins and eliminating inefficiencies at all phases of flight.

100 out of the 127 delivered SESAR solutions have positive effects on the environment and more solutions are in the pipeline.

The estimation is that the **mature SESAR 1 and SESAR 2020 solutions can already enable a reduction of 4% in CO2 emissions**

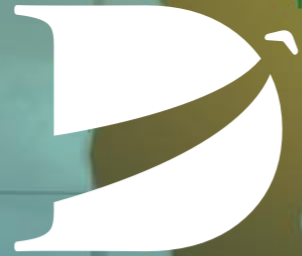


Thank you!



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DESTINATION
2050

A4E & ASD - 13 June 2023

Innovation Fund: Stakeholder Consultation Event on the next calls for proposals

A ROUTE TO NET ZERO
EUROPEAN AVIATION

Destination 2050 Roadmap



DESTINATION
2050

Scope

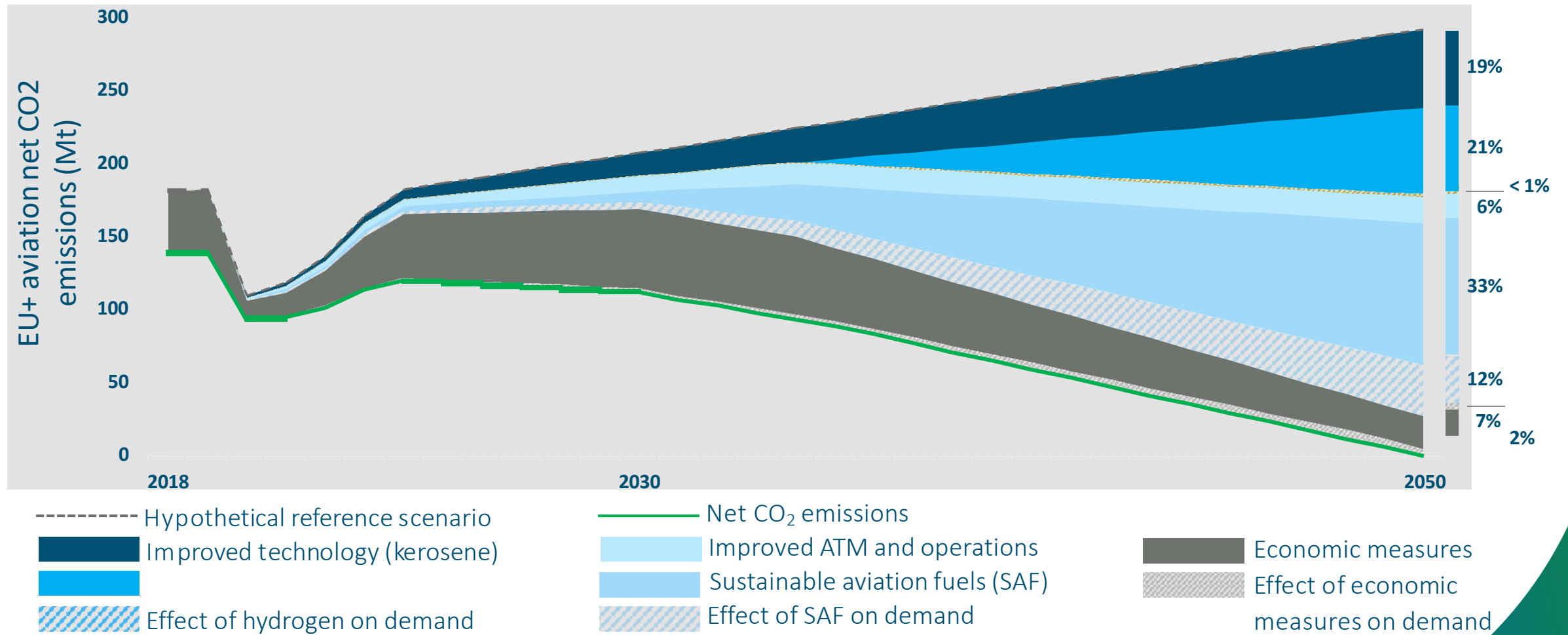
Geographical scope: “EU+” European Union (EU), UK, and European Economic Area (EEA)

Flights: Commercial flights departing from airports within the EU+

Emissions: CO₂ emissions



Destination 2050 identified a decarbonisation roadmap for European aviation



Destination 2050 pathway

All flights in scope

- **2050 Net zero CO₂ in the year 2050**
93% decrease in absolute CO₂ emissions
7% remaining CO₂ emissions removed from the atmosphere:
 - natural carbon sinks
 - dedicated technologies (DAC)
- **2030** 46% decrease in net CO₂ emissions, compared to reference
35% increase in net CO₂ emissions, compared to 1990
- **2019 Estimated peak year in absolute CO₂ emissions**

Price of net zero



DESTINATION
2050

As follow-up, NLR and SEO have studied the expenditure needs to realise Destination 2050, finding



Expenditures needed to reach net zero aircraft emissions for European aviation by 2050 require considerable **additional efforts** compared to business as usual



The premiums paid towards new aircraft technologies, air traffic management, sustainable aviation fuels and negative emissions amount to **€820 billion over the 32-year period**



A **successful, on-time decarbonization therefore requires sufficient access to finance and public investments**, which in turn depend on supportive legislation

This study was approached consistent with Destination 2050 methods and results

› Bottom-up expenditure assessment along four pillars of measures

- Technology, operations, alternative fuels and carbon pricing
- Identical scope: scheduled flights within and departing the EU+
- Measures exactly as modelled in Destination 2050

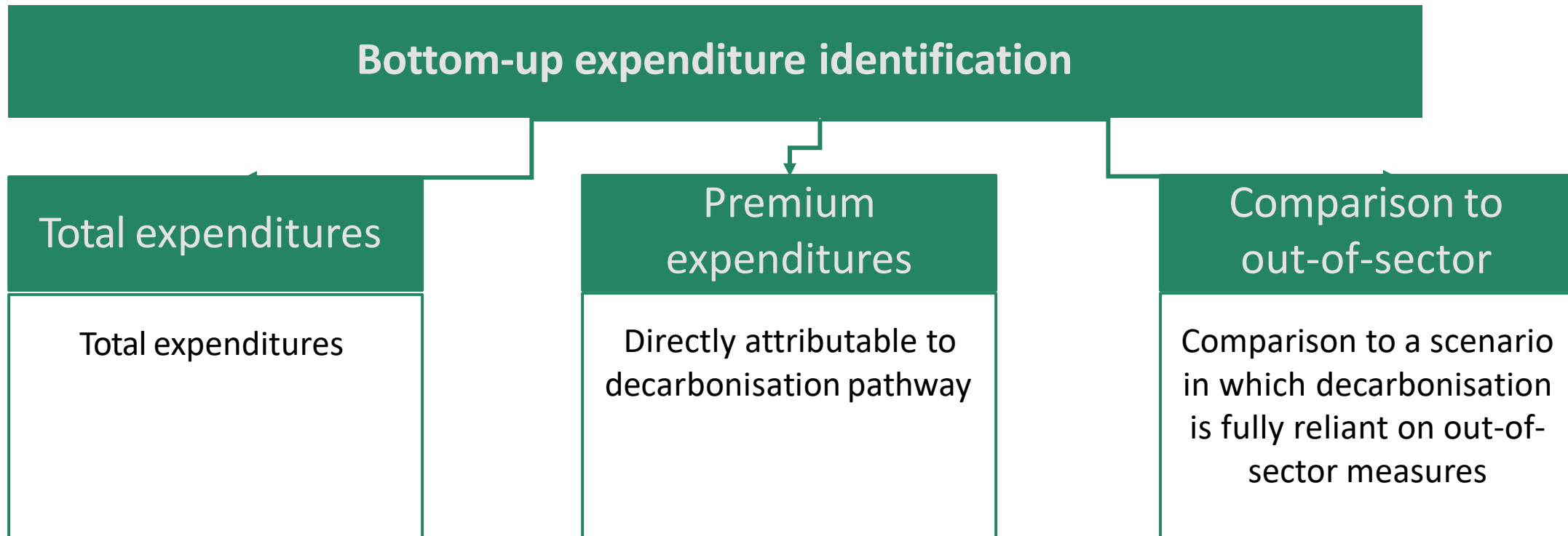
› Limited to expenditures directly related to aircraft carbon emissions

- Excludes (e.g.) changes in MRO cost, personnel costs, ...

› Expenditures = investments + cost

- Within 'core' of the aviation sector (e.g. fleet renewal): investment
- Outside 'core' of the aviation sector (e.g. SAF): passed on as costs

Following expenditure identification, totals were studied from three perspectives



Expenditures were identified per measure, across four pillars

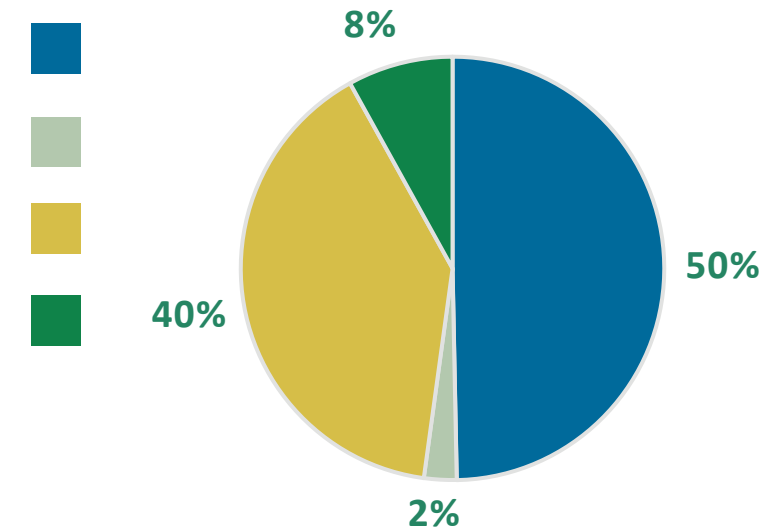
Technology	• Future aircraft research and development	100 B€	
	• Fleet renewal	820 B€	
	• Ground infrastructure for future aircraft <i>Recharging hybrid-electric aircraft; refuelling hydrogen-powered aircraft</i>	18 B€	
	TOTAL	938 B€	+
Operations	• Airline operations	+/- B€	
	• Airspace and ATM	38 B€	
	• Ground operations at airports <i>Reducing taxi emissions; reducing APU usage</i>	9 B€	
	TOTAL	47 B€	+

Expenditures were identified per measure, across four pillars

Alternative fuels	• Drop-in sustainable aviation fuels	689 B€	
	• Hydrogen for use by H ₂ -aircraft	62 B€	
	• Electricity for hybrid-electric aircraft	< 1 B€	
	TOTAL	751 B€	+
Carbon pricing	• EU ETS and CORSIA <i>Modelled as in main Destination 2050 study</i>	152 B€	
	TOTAL	152 B€	+

Total expenditures add up to 1.888 B€ over 32 years, but include ‘business as usual’ expenditures

• Improvements in technology	938 B€
• Improvements in ATM and operations	47 B€
• Alternative fuels	751 B€
• Carbon pricing / negative emissions	152 B€
TOTAL	1.888 B€



These expenditures cover more than decarbonisation alone, but span

- › ‘Business as usual’ (BAU): expenditures that “would occur anyway”
- › “Premium”: expenditures that are directly related to Destination 2050

Less than half of total expenditures – 820B€ – is ‘premium’ and critical in realising Destination 2050

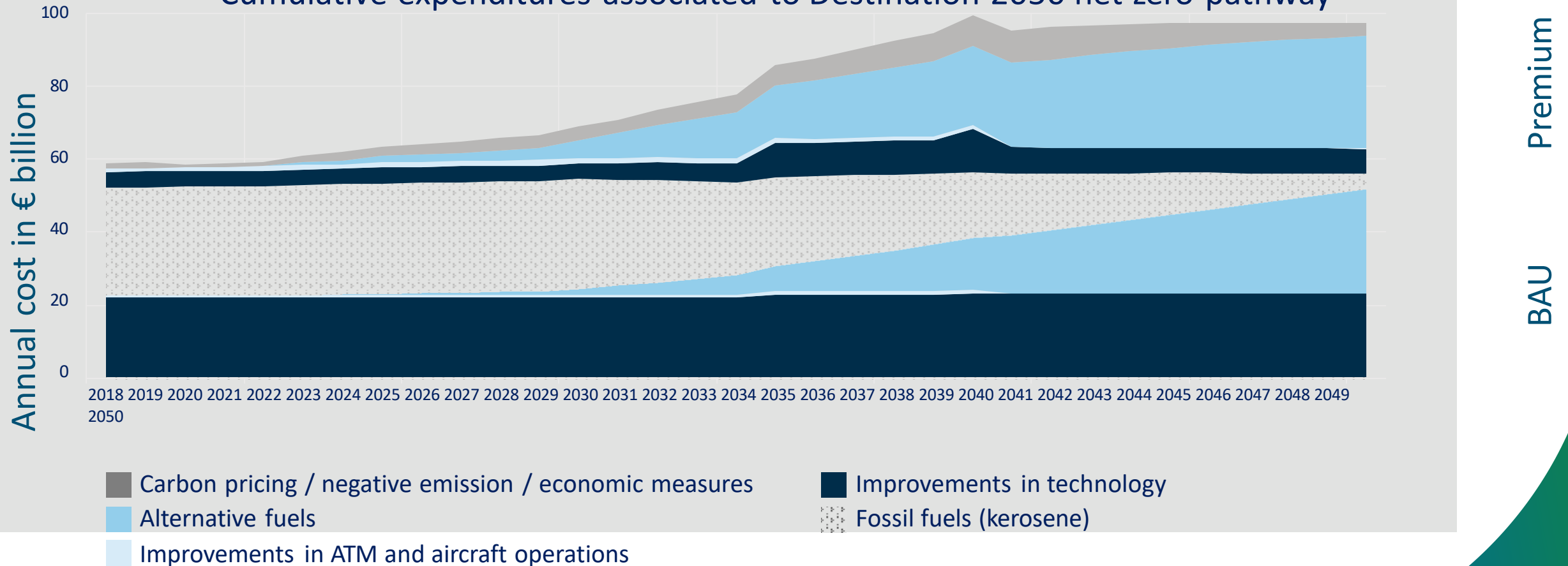
	TOTAL	PREMIUM	BAU
• Improvements in technology	938 B€	198 B€	
• Improvements in ATM and operations	47 B€	29 B€	
• Alternative fuels	751 B€	441 B€	
• Carbon pricing / negative emissions	152 B€	152 B€	
TOTAL	1.888 B€	820 B€	1.068 B€

Largest differences relate to

- fleet renewal
- alternative fuels

Premium expenditures increase over time, reducing fossil fuel costs and avoiding carbon cost

Cumulative expenditures associated to Destination 2050 net zero pathway



Reiterating — the key findings



Expenditures needed to reach net zero aircraft emissions for European aviation by 2050 require considerable **additional efforts** compared to business as usual



The premiums paid towards new aircraft technologies, air traffic management, sustainable aviation fuels and negative emissions amount to **€820 billion over the 32-year period**



In-sector decarbonization is achievable and is **cheaper than out of sector** decarbonization of aviation

Conclusions



Substantial additional efforts (820 billion Euro) required to reach net zero aviation by 2050 compared to business as usual scenario. This requires a strong partnership between the EU civil aviation sector and EU institutions based on common goals.



A successful, on-time decarbonization therefore requires sufficient access to finance and public investments, which in turn depend on supportive legislation i.a. ETS Innovation Fund, taxonomy, support SAF through NZIA, research funding (Clean Aviation & SESAR), H2 bank

Recommendations for financial support

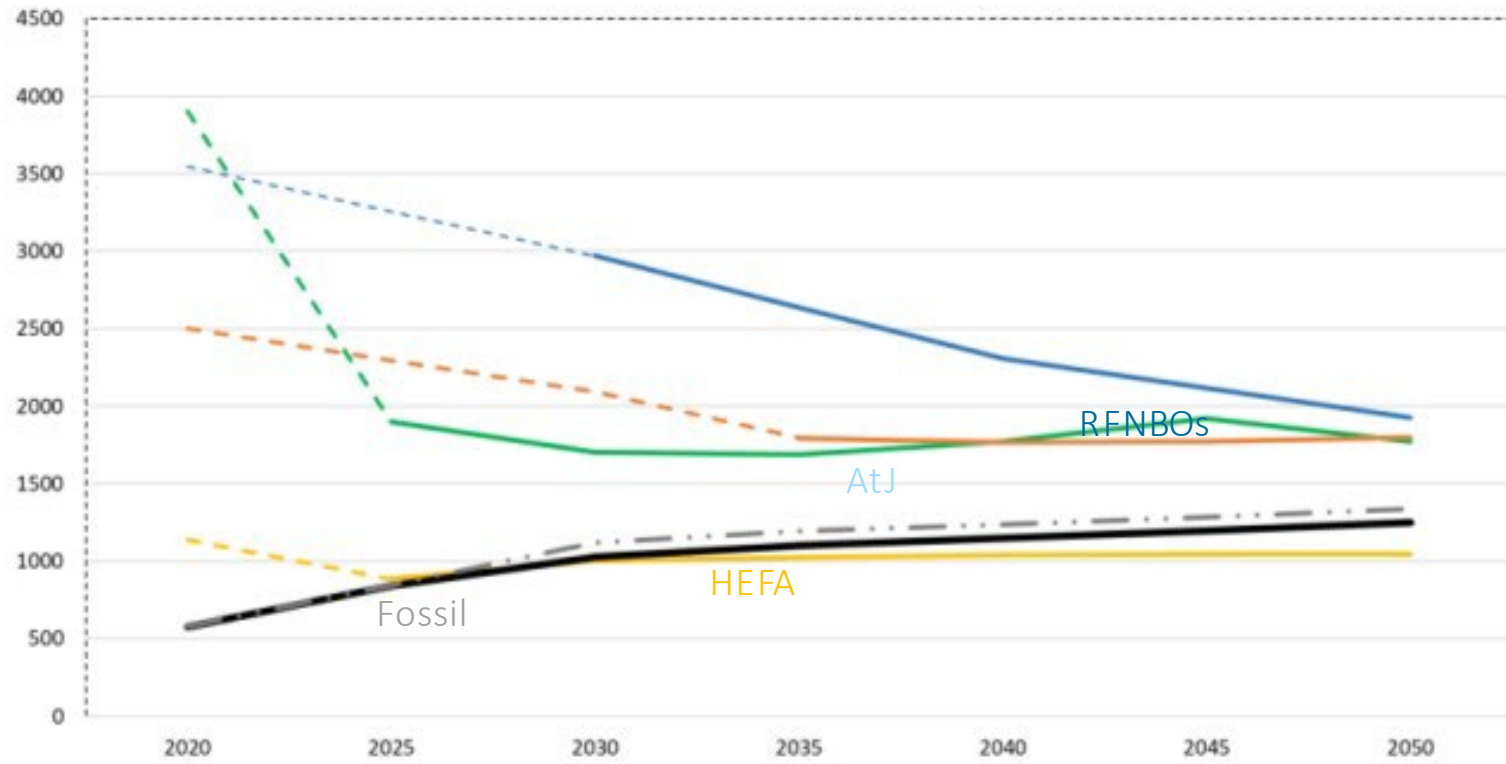


DESTINATION
2050

Diverging prices between jet fuel and SAF

Production cost development for SAF production pathways (in €per ton of fuel)

Source: EC impact assessment accompanying RefuelEU proposal 2021



SAF cost assumptions, 2030 (Source: NLR/SEO, 2021)

- Kerosene – **600** €/tonne (excl. CO2)
- HEFA pathways with various waste and residue feedstocks - **1170** €/tonne
- Advanced feedstocks combined with FT, ATJ, SIP - **2765** €/tonne
- Power to Liquid FT - **2900** €/tonne

Aviation decarbonisation – EU support and role

- **6% SAF EU mandate by 2030, with a steep ramp-up to 20% in 2035:**
 - **Less than 1% SAF today**
 - Sustainable production ramp up and scaling up needed
 - Role of Innovation Fund, Hydrogen Bank **is vital to support the ramp-up but needs to be clarified**
- **Aviation will need both SAF and Hydrogen** production infrastructure financing:
 - Large corporate: capital market access (bonds and other financial instruments)
 - Small and mid size companies: heavy reliance on project finance structuring
 - Project finance structuring recommendations:
- Pipeline:
 - Chicken and egg situation: unlocking of many projects/initiatives once the EU framework will be in place
 - Simple, timely and flexible access to EU support will be key – Most critical for ramp up

EIF, a key funding instrument for potential project promoters and maturation of new SAF pathways

- Current energy demand and availability of resources to support the EU climate ambition (availability of feedstocks and raw materials; bottlenecks in the value chain and the integration of the other sectors (agri, chemicals, forestry, waste and recycling); enabling conditions; risks linked to technical feasibility, costs and unintended consequences for the society; "no silver bullet" and key actions to replace the (fossil) liquid demand
- Synergies among all transport sectors, especially in the transitional phase
- Technological paths and the associated costs

Availability of feedstocks, synergies among sectors and Just transition

Production Pathways and value chain – Aviation

Production Pathways and value chain – Waterborne Transport

Access to public and private finance

- Common knowledge basis (stocktaking exercise)
- Roadmap for scaling up SAF taking into consideration the diverse maturity of SAF pathways (certified and new ones)
- European SAF dynamic market
- Certification of new SAF pathways (EU Clearing House)
- Investment pipeline with sustainable aviation fuels projects

- Engage with public and private financial institutions to invite them to join the Alliance and provide expertise on the existing funding and financing schemes, including in view of the preparation and implementation of the project pipeline.
- Map the availability, conditions and suitability of existing tools, and build an F&F Investment Guide
- Organise dedicated exchanges on the different funding and financing instruments and potential new ones, sequencing tasks for structuring industrial projects, business models and bankability of projects.

- Common knowledge basis (stocktaking exercise)
- Technology and Commercial Readiness Levels for different Fuel Products
- Feasibility of utilisation of different RLCF and of defining Sustainable Maritime Fuels (SMF)
- RLCF certification framework
- Guidance for drafting of Fuel Supply Contract templates for Maritime Operators
- Common pipeline of existing/new projects

RLCF Alliance Work Program 2022/2023

AZEA core tasks

Analyse

- ❖ Identify all **barriers** (including policy and regulatory needs)
- ❖ Define **requirements** for the entry-into-service of electric and hydrogen aircraft (energy, investments, etc.)
- ❖ Asses the **actions** required to overcome barriers and support investments

Connect

- ❖ Promote **investment** projects and connect them to financing partners
- ❖ Foster **partnerships** and maximize **synergies** across the ecosystem and beyond
- ❖ Create the necessary **momentum** amongst stakeholders
- ❖ **Outreach** and International partnerships

ANALYSIS (ad hoc Working Groups)

ROADMAP towards the introduction of electric and hydrogen aircraft (update and monitoring)

SUPPORT INVESTMENTS PROJECTS and OUTREACH

Recommend

Establish a **Roadmap** :

- ❖ Based on a roll-out scenario for zero-emission aircraft
- ❖ Providing actionable recommendations and clear objectives to address all investments required and barriers identified (legislation, standardisation, operations, skills, etc.)
- ❖ Defining priorities and milestones
- ❖ Serving as a reference to support the coordinated actions required by the different actors involved

Recommendations

The ETS Innovation Fund should :

- **Allow assignability of EU support (subsidies and EU offtake contract) to bank and investors**
- **Facilitate the establishment of a price stability mechanism for SAF and Hydrogen** as the market matures with a specific focus on investment in SAF production benefits the decarbonisation of operators complying to the ETS.
- **Identify EU offtaker entity/subsidizing; credit rating needs to be highest investment grade possible**
- **Consider Export credit model (guarantees, funding, premium)**



Innovation Fund

Session Moderation

13 June 2023





Session Moderation

Aviation

Laura Pereira



We want to hear your views and your experience

1

What are the most promising technologies and strategies for reducing emissions in this sector?

2

What are the main lessons learned from recent projects implemented in Europe, and how to avoid repeating mistakes in new projects?

3

Which areas would benefit from auctions in addition or as an alternative to grants? What additional funding measures are required?

1

What are the most promising technologies and strategies for reducing emissions in this sector?

Design changes that leads to more efficient aerodynamics

Production and/or use of electric or hydrogen-based aircrafts

Engine efficiency

Use of sustainable aviation fuels

Operational measures (e.g., adjusted flights and paths management, speed limitation approaches, software improvements)

Projects that also reduce overall emission of non-CO2 emissions (e.g. water vapor)

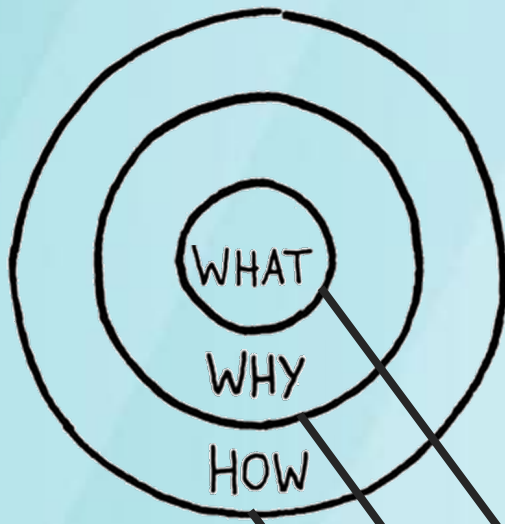
IF funded projects

HySkies - building the **first largescale synthetic sustainable aviation fuel (SAF)** production facility in Sweden. It will produce around 82 000 tonnes SAF and 9 000 tonnes of renewable diesel per year (grant EUR 80 200 000, location **Uppsala** and **Forsmark**, Sweden).

Biozin - building the world's **first commercial-scale drop-in biofuel** (i.e., renewable hydrocarbon biofuels with fuel infrastructure compatibility) converting sustainable organic waste, such as residues from forestry and sawmills into renewable transportation fuels using a continuous catalytic thermochemical process. BIOZIN will annually produce 30, 11 and 55 kilotonnes (kt) of zero-emission jet fuel, diesel and gasoline, respectively (grant EUR 75 000 000, **Amlí**, Norway)

What are the main lessons learned from recent projects implemented in Europe, and how to avoid repeating mistakes in new projects?

2



What went well, or what did not go so well?

Why has this happened this way?

How could this experience be replicated (if positive) or avoided (if negative)?

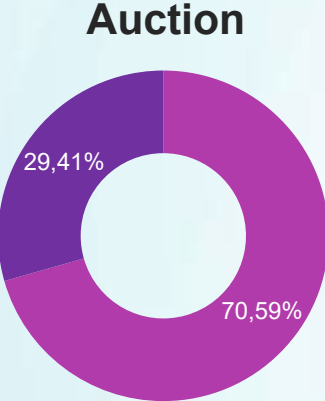
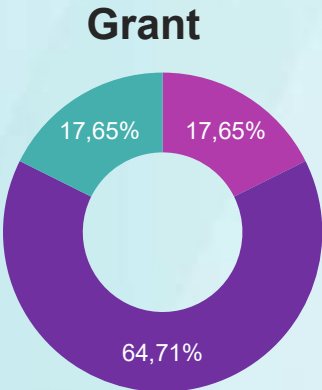
Examples of factors that help avoiding negative experiences and enabling reliable paths for implementation

1. Adequate allocation of funds and contingency
2. Realistic schedule
3. Proper forecasting of barriers
4. Timely management of risks
5. Diligent design and implementation/construction planning
6. Diligent progress monitoring
7. Experienced, well-trained and committed project team
8. Good networking with suppliers, project partners, regulatory agencies, local politicians and communities
9. Well developed and comprehensive contract documents
10. Adequate investigation during project commissioning

Which areas would benefit from auctions in addition or as an alternative to grants? What additional funding measures are required?

Preferences in Innovation Fund grants and auction spending criteria in the Aviation sector

Grants (current IF funding) award up to 60 % of a project's relevant cost (i.e., funding gap over 10 years)



Auctions (i.e., competitive bidding) award a fixed premium or (carbon) contracts for difference type of support



Wrapping up: SLIDO polls [multiple choice]

1

What subsector are you from?

- Airline industry (incl. cargo)
- Aircraft manufacturing
- Airport operation
- SAF production
- Other

2

What kind of projects are you planning?

- Design changes
- Production of electric/hydrogen-based aircrafts
- Use of electric/hydrogen-based aircrafts
- Engine efficiency
- Use of SAFs
- Operational measures
- Other

3

Which areas would benefit from auctions? Other funding measures required?

- auctions are useful for the whole sector
- auctions are useful for certain sectoral techs
- public funding other than grants and auctions is required

Q&A on slido

Join at
slido.com
#WGAC



Thank you



https://cinea.ec.europa.eu/programmes/innovation-fund_en



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[European Climate, Infrastructure and Environment Executive Agency](#)



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Innovation Fund Stakeholder Consultation event

13 June 2023 - In person and online

Lunch time 13:00 – 14:00 CEST

Next session – workshops:

- Clean tech manufacturing including RES and storage → Room 0D (ground floor)
- Maritime → Room 4B (fourth floor)

Please note the event is livestreamed and recorded.

