



# CALL FOR EXPRESSION OF IDEAS/POTENTIAL MEMBERS (CEI)



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European Commission

# Call for Expressions of Ideas/Potential Members (CEI)

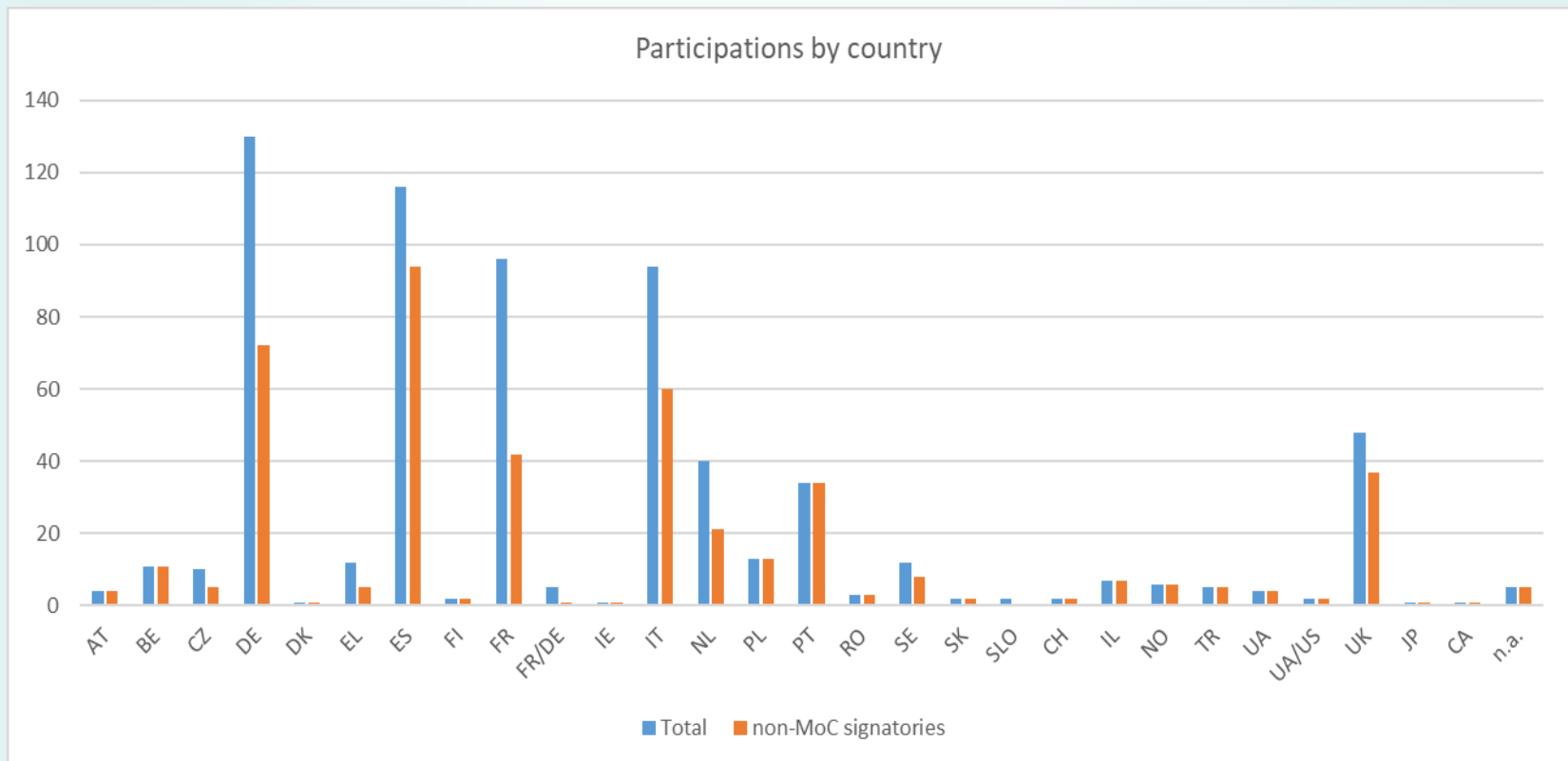
- The Call for Expressions of Ideas/Potential Members (CEI) is part of an innovative process for preparing the future European Partnership on Clean Aviation.
- It was calling interested technology stakeholders who can provide transformative ideas/concepts, to contribute to the European Green Deal (EGD) goals, to express their intention to co-invest in the programme and its major demonstrator platforms **in order to maximise the impact of the proposed Clean Aviation Joint Undertaking.**
- We were looking for innovative approaches:
  - to define an ambitious technological roadmap;
  - to identify the most effective pathways able to reach the desired environmental impact;
  - to co-design the work programme of the proposed Clean Aviation Joint Undertaking, prior to its establishment, including from sectors beyond aviation.
  - and to complement the proposed private Membership of the future JU with additional stakeholders meeting key qualifying criteria in terms of operational capacity, key capabilities/competences required for contributing to the Clean Aviation SRIA and its objectives and ability to invest in-kind and financial resources.

# CEI General Overview

Number of submitted ideas: **82**

Number of participations: **670** - of which 221 from signatory entities of the Memorandum of Commitment (MoC) -

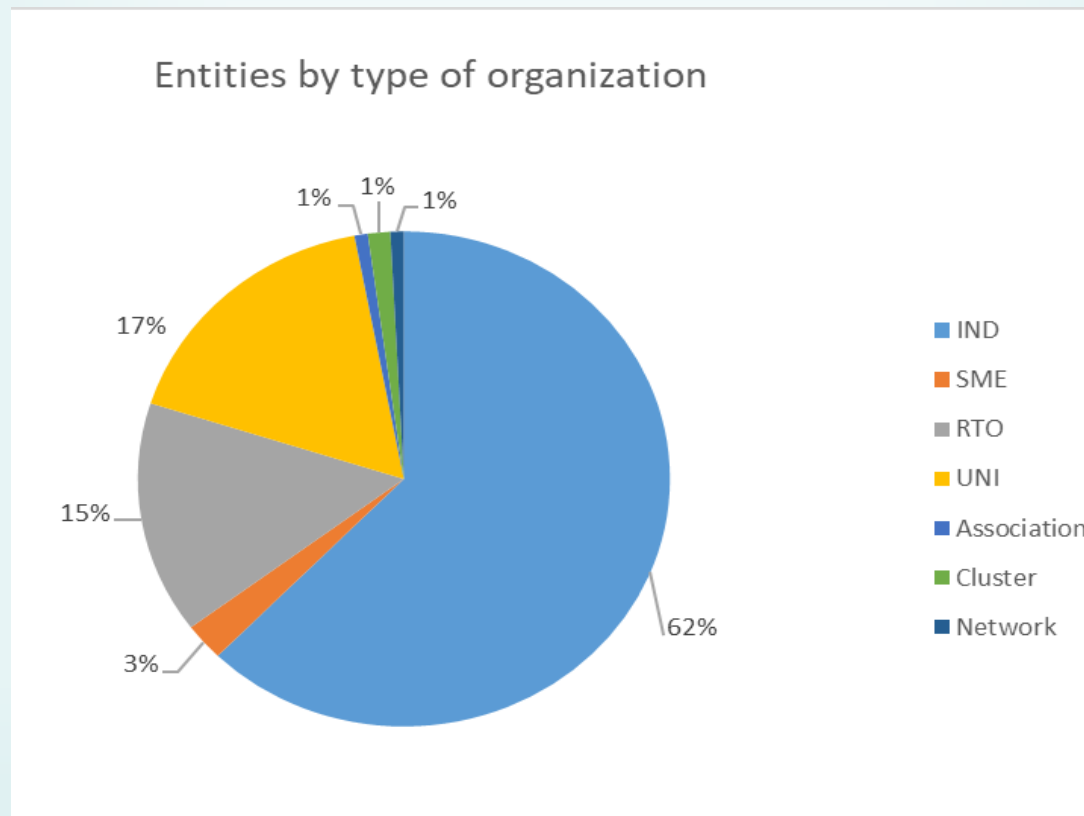
Number of single legal entities: **369** - of which 55 are either MoC signatories (29) or linked to / affiliated with MoC signatories -



# CEI General Overview

Number of legal entities in the applications: **369**

**62% from Industry**  
**17% from Academia**  
**15% from RTOs**  
**3% from SMEs**

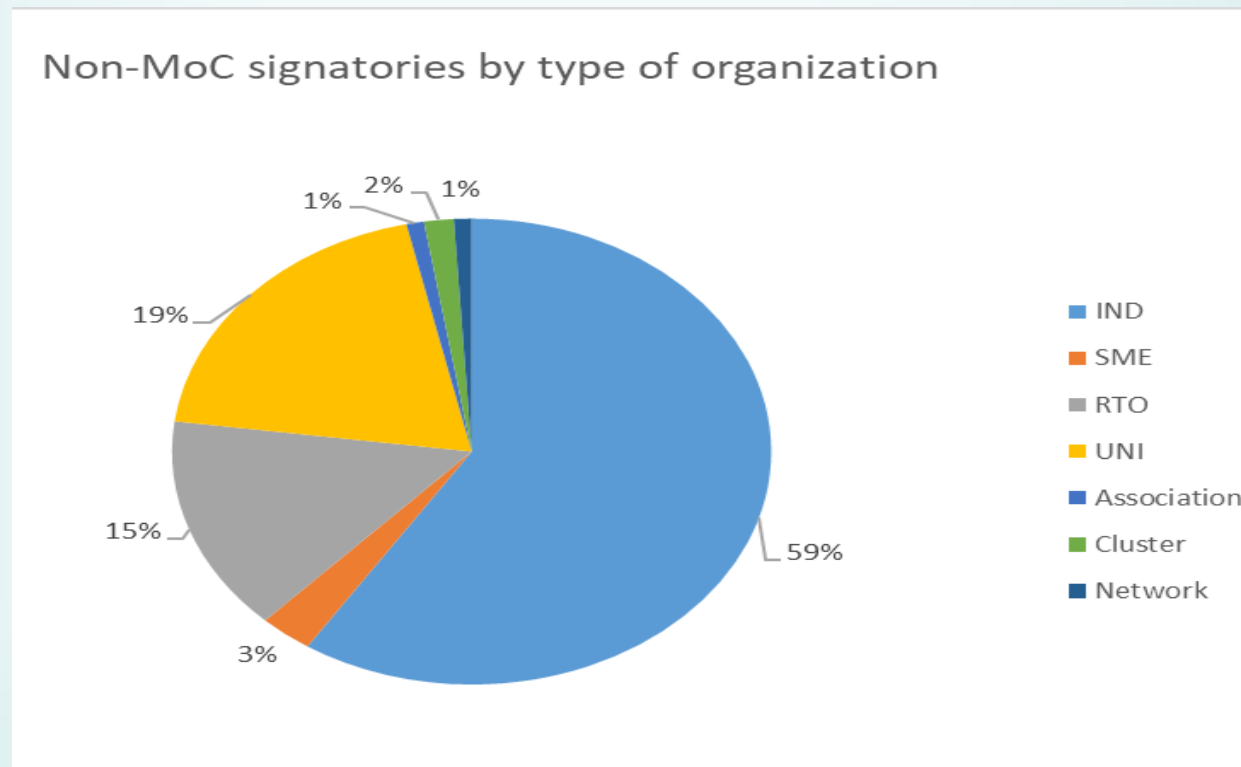


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# CEI General Overview

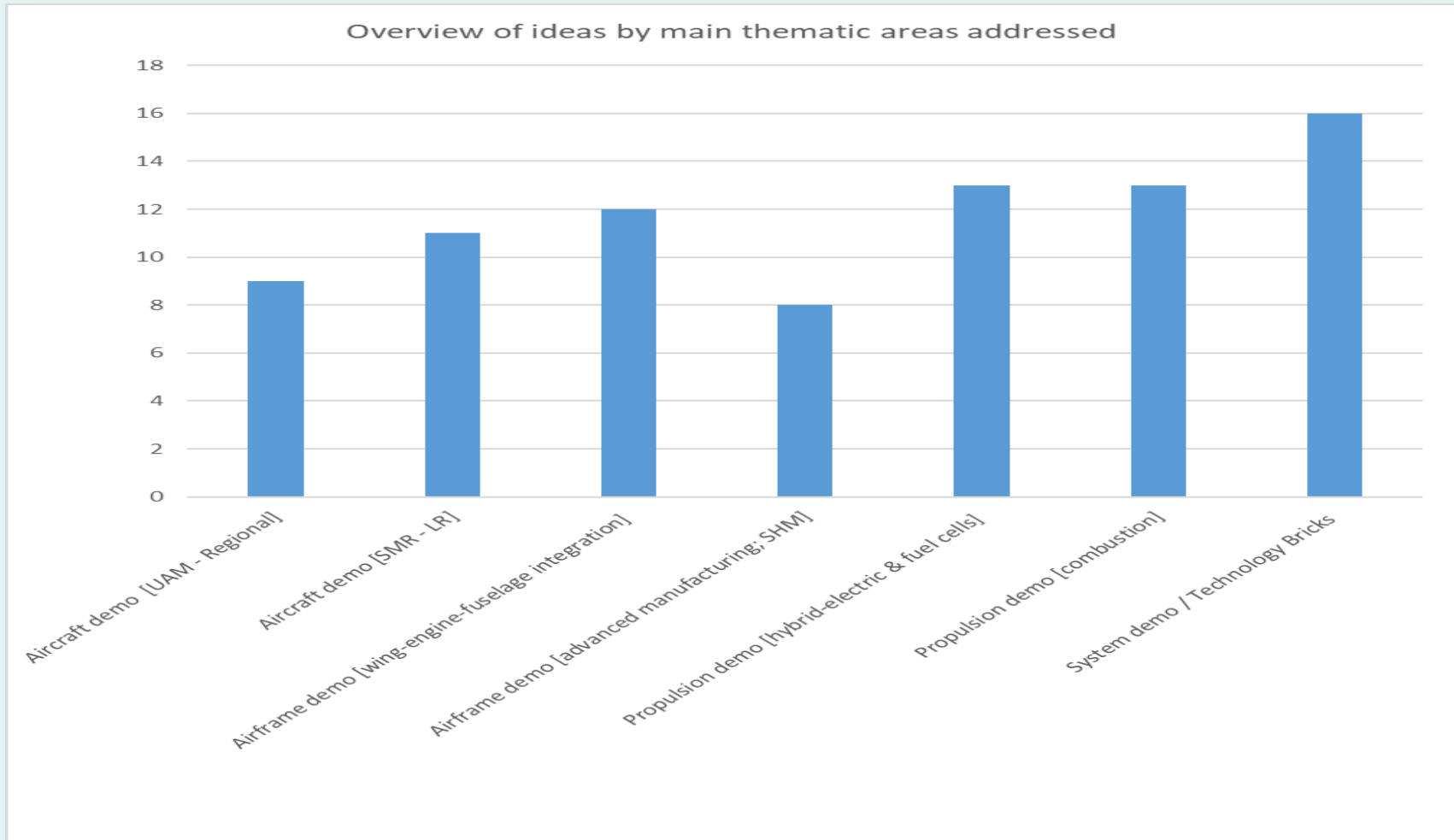
Number of NEW (not involved in MoC) legal entities in the applications:  
**355**

**59% from Industry**  
**19% from Academia**  
**15% from RTOs**  
**3% from SMEs**



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# CEI General Overview



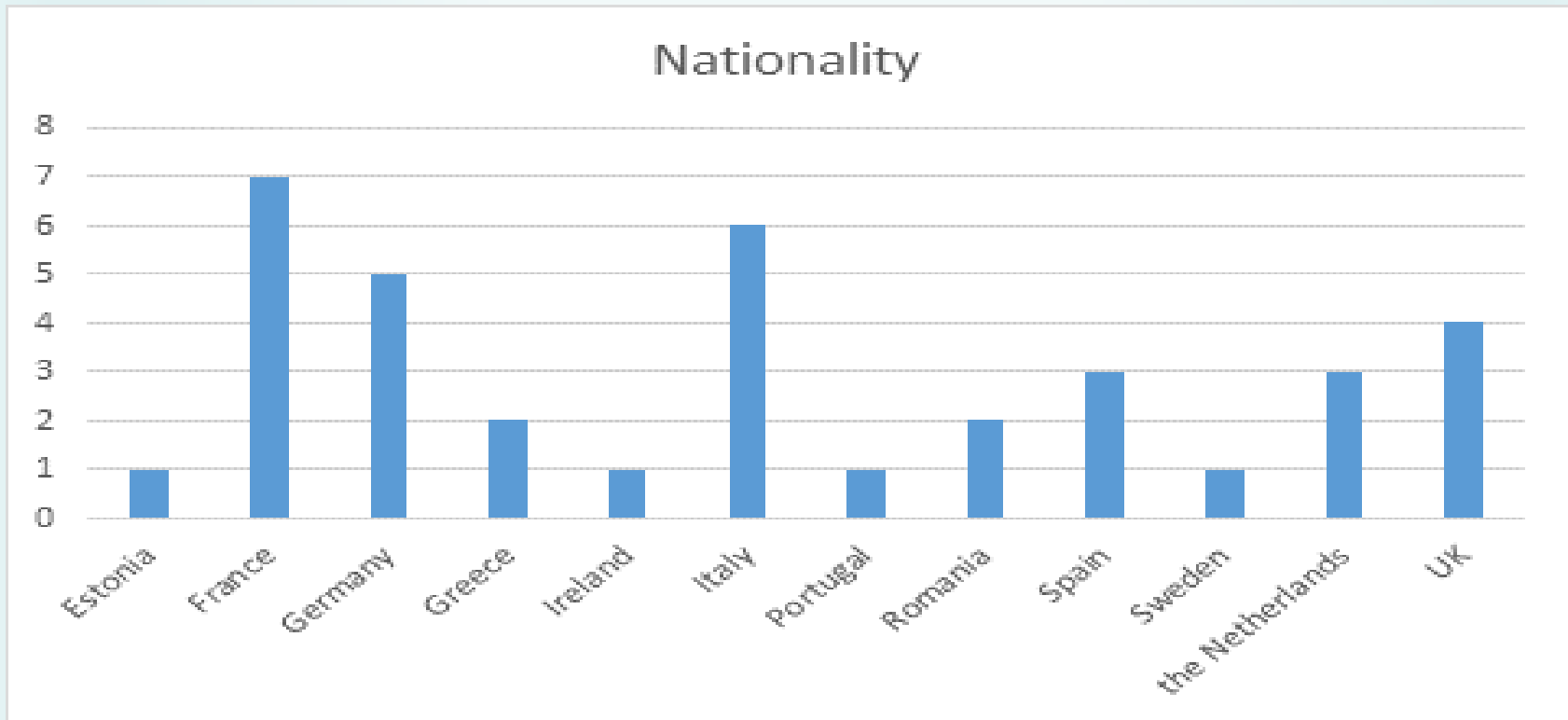
**UAM: Urban Air Mobility**  
**SMR: Short-Medium Range**  
**LR: Long-Range**  
**SHM: Structural Health Monitoring**

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# Assessment by independent experts

Number of experts contracted: **36**

Gender balance: 25 M and 11 F



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# 4 assessment thematic areas

- **Aircraft Demo**
- **Airframe Demo**
- **Propulsion Demo**
- **System Demo / Technology Bricks**

# 8 assessment panels

- **Aircraft Demo 1 & 2**
- **Airframe Demo 1 & 2**
- **Propulsion Demo 1 & 2**
- **System Demo / Technology Bricks 1 & 2**

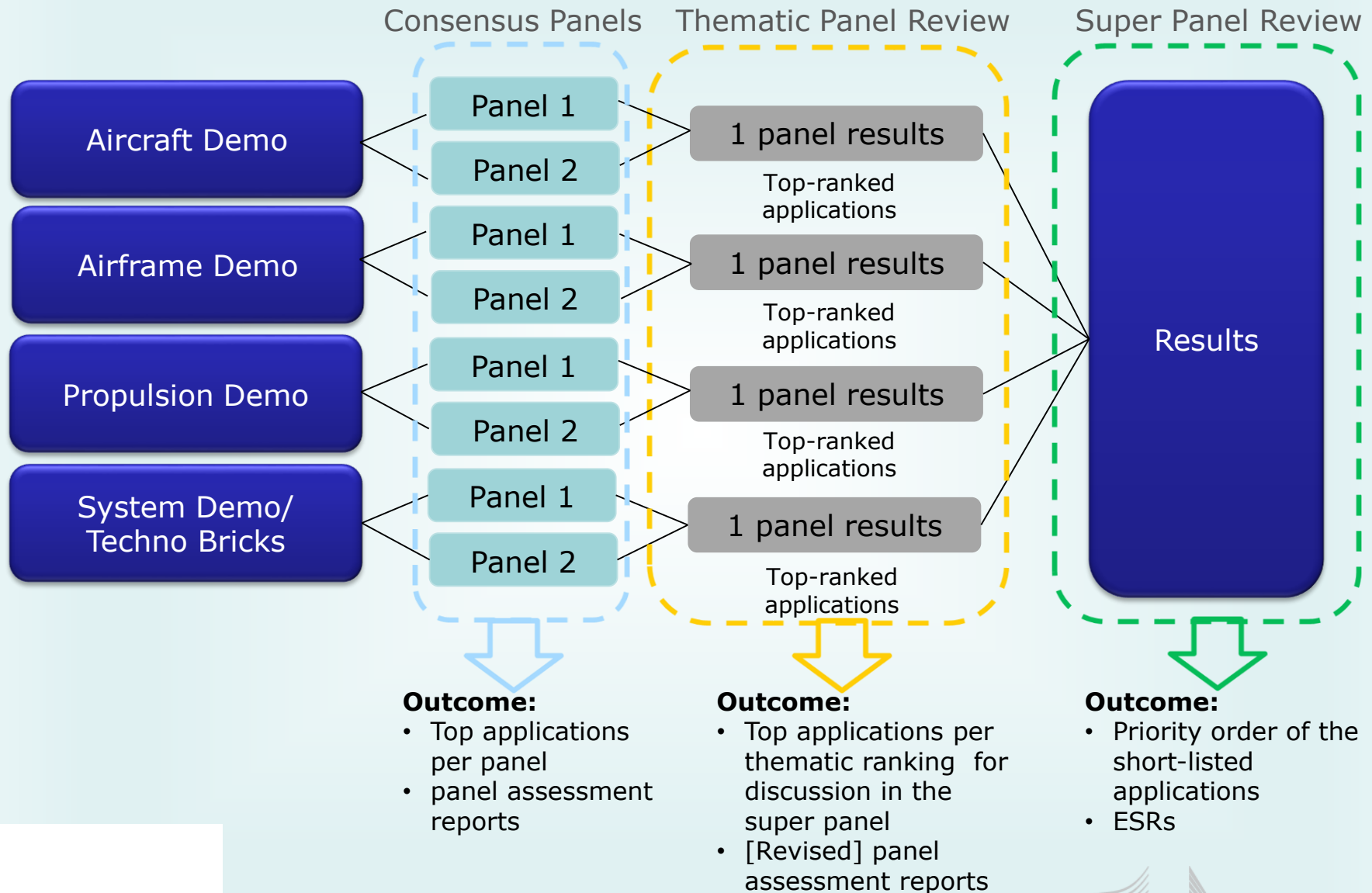


# The 8 assessment panels

<b>Aircraft Demo (1)</b> [UAM-regional]	<b>Aircraft Demo (2)</b> [SMR-LR]	<b>Airframe Demo (1)</b> [wing-engine-fuselage integration - factories of the future - cabin design]	<b>Airframe Demo (2)</b> [advanced manufacturing - SHM]
<b>Propulsion Demo (1)</b> [hybrid-electric - fuel cells]	<b>Propulsion Demo (2)</b> [thermodynamic - combustion]	<b>System Demo / Technology Bricks (1)</b>	<b>System Demo / Technology Bricks (2)</b> [heat exchangers]

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# Consensus phase, review & ranking



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# CEI main outcome

**Out of the 82, only 17 applications have reached the final panel**

- **Aircraft Demo: 1**
- **Airframe Demo: 6**
- **Propulsion Demo: 7**
- **System Demo/Technology Bricks: 3**

# CEI main outcome

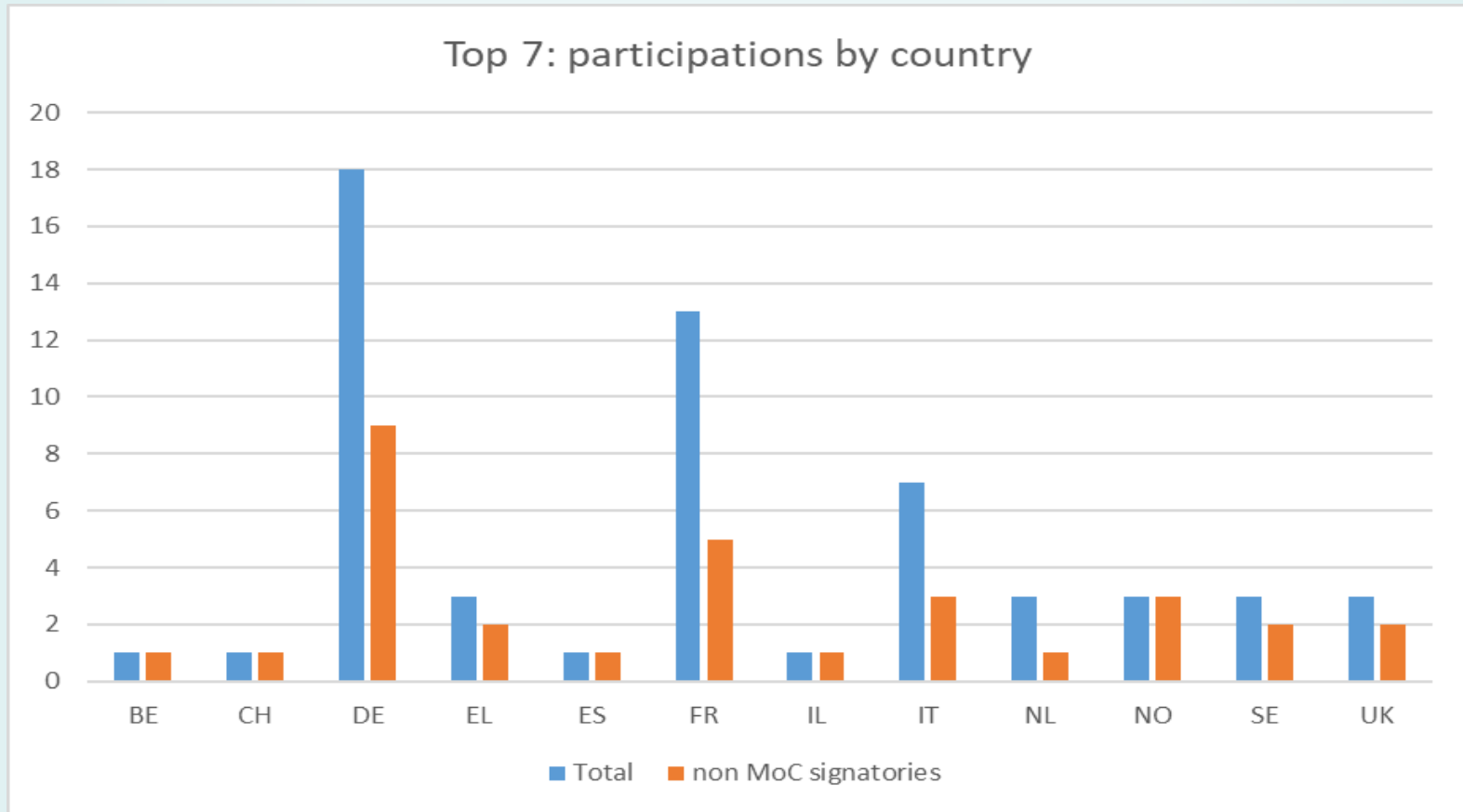
**Only 7 TOP applications have been retained by the final panel**

- **Aircraft Demo: 1**
- **Airframe Demo: 0**
- **Propulsion Demo: 4**
- **System Demo/Technology Bricks: 2**

# CEI TOP IDEAS

Number of participations: 57

Number of single entities: 47 - of which 17 are MoC signatories or linked to / affiliated with MoC signatories -

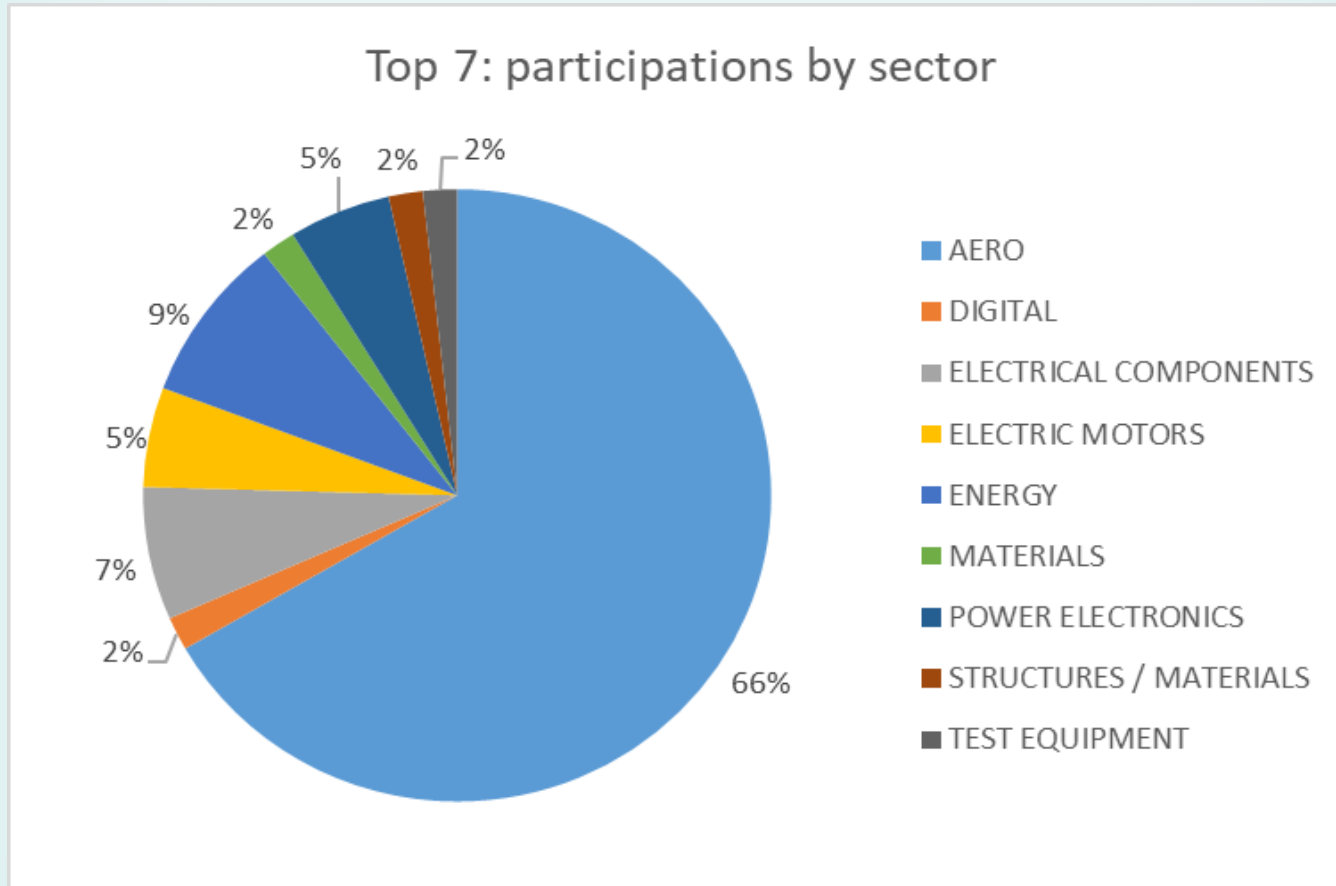


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# CEI TOP IDEAS (1)

Number of participations: 57

Number of single entities: 47 - of which 17 are MoC signatories or linked to / affiliated with MoC signatories -



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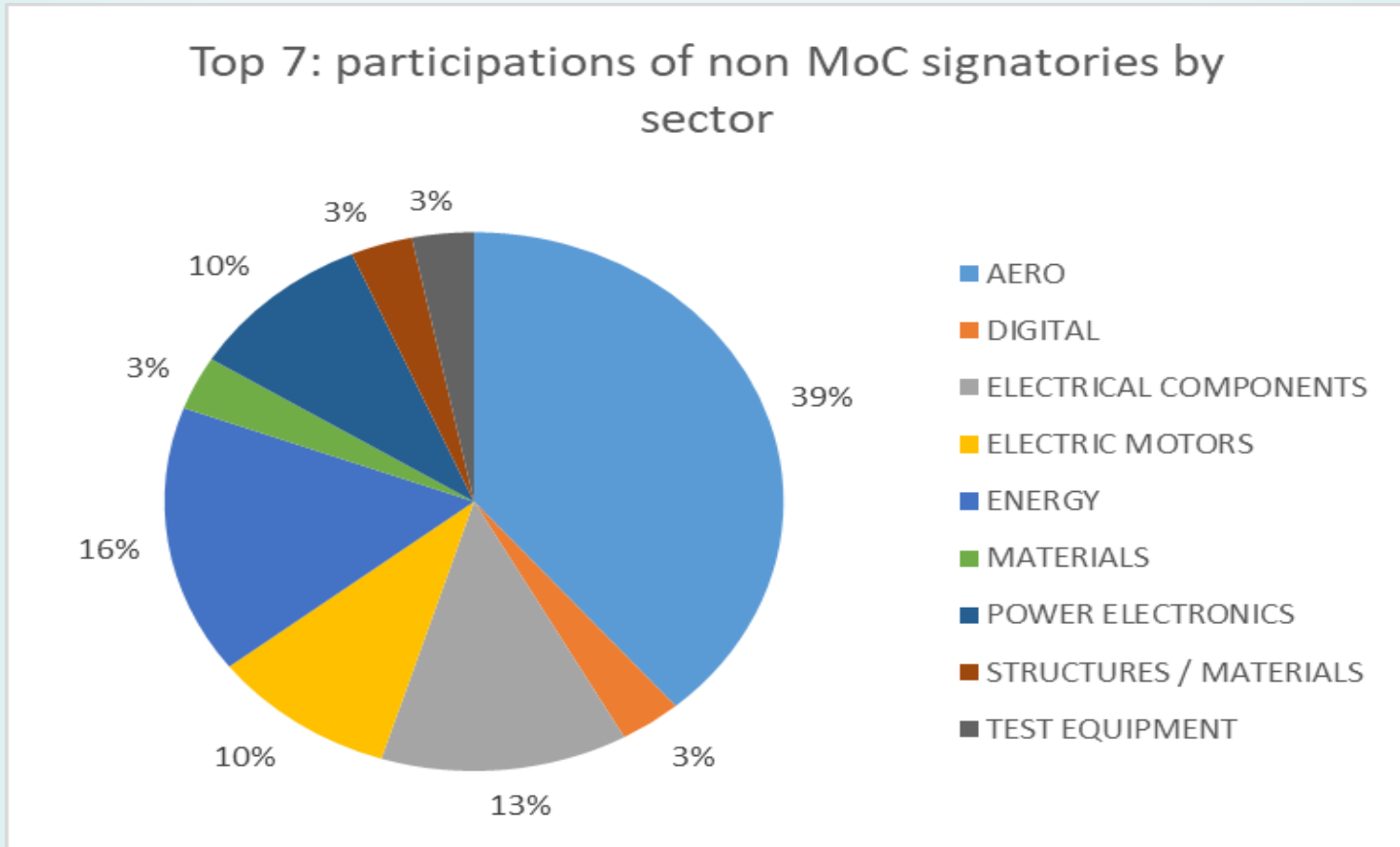


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# CEI TOP IDEAS (2)

Number of participations: 57

Number of single entities: 47 (of which 17 are MoC signatories or linked to / affiliated with MoC signatories).



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# TOP 7 ideas (3)

- [CEI-2020-61 "WET2030+"](#) (coordinated by MTU Aero Engines AG; Germany; total cost: 160 m€)

This idea proposes the development of advanced powertrain for ultra-efficient SMR aircraft architectures. The proposed engine architecture called Water-Enhanced Turbofan (WET) generates significant amounts of steam using the exhaust heat and injects this into the combustion system to reduce peak temperatures to reduce CO<sub>2</sub> and NO<sub>x</sub> emissions. Such steam injection is a proven technology in large-scale stationary gas turbines, although with increased weight. The water is recovered in the exhaust system using a condenser system. The water cycle is claimed to reduce CO<sub>2</sub> emissions by 25%, NO<sub>x</sub> by 80% and possibly reduce contrails.

- [CEI-2020-25 "HEROPS"](#) (coordinated by MTU Aero Engines AG; Germany; total cost: 242 m€)

This idea proposes the development of fuel-cell based propulsion for regional hybrid electric/full electric aircraft architectures. The idea addresses the use liquid hydrogen as energy carrier for the fuel cells, as well as the development of subsystems, power level and expected technology maturity for integration and testing. The proposed "Flying Fuel Cell" propulsion system targets a power of >3MW, which is ambitious, achievable and in line with the requirements for a regional aircraft. Flight demonstration of TRL6 technologies is foreseen by 2030.



# TOP 7 ideas (4)

- [CEI-2020-53 "TOOP" \(coordinated by Airbus; Germany; total cost: 170 m€\)](#)

This idea proposes the development of superconducting and cryogenic powertrain for regional hybrid electric / full electric aircraft architectures. The proposed technologies uses liquid hydrogen as cryogenic source. This is a high risk but potentially a very valuable disruptive programme. The combination of both superconducting and cryogenic technologies is the key to the increase in electrical performance of the electric propulsion. Flight demonstration is foreseen by 2030.

- [CEI-2020-52 "HYPE" \(coordinated by GE Avio Aero; Italy; total cost: 160 m€\)](#)

This idea proposes the development of hydrogen-combustion turbine for large-scale hydrogen-powered regional aircraft architectures. The technological and overall outcomes will also significantly benefit hydrogen-powered SMR aircraft due to its scalability. The proposed technology maturation includes developments of the fuel system and controls, combustion system and engine integration. The proposed timeline is ambitious, having ground test demonstration by end 2024, flight readiness and potential aircraft launch in 2025, and potential Entry Into Service (EIS) around 2030.

# TOP 7 ideas (5)

- CEI-2020-42 "HYTALIA" (coordinated by RISE SICOMP; Sweden; total cost: 3.5 m€)

This idea proposes the development of aircraft ultralight, safe and reliable tanks for liquid hydrogen storage for regional hybrid electric / full electric aircraft architectures. It addresses key-challenges related to the thermo-mechanical constraints, as well as to the placement of tanks aboard the due to the need of adopting conformal shapes, which demand mechanical advancements. Several alternatives will be investigated. The outcome will be a set of advanced composite hydrogen tanks designed to be accommodated in a conventional airframe and validated at a TRL consistent with a EIS in 2030-35.

- CEI-2020-32 "Certif2035" (coordinated by Dassault Aviation; France; total cost: 39.4 m€)

This idea proposes the development and establishment of certification regulations and means of compliance for disruptive technologies necessary to achieve the targets set out in the SRIA. The proposed approach is relevant to different aircraft segments, including SMR and regional. The test cases will focus on high voltage power distribution, active flutter control and hydrogen as new energy carrier, also using digital integration, virtual testing and Artificial Intelligence. The involvement of the European Aviation Safety Agency from the activities start is key to identify critical areas and regulatory gaps, coherently elaborate on technical conditions for future rulemaking processes and demonstrate their viability.

# TOP 7 ideas (6)

- [CEI-2020-79 "GREAT" \(coordinated by SINTEF AS; Norway; total cost: 25 to 40 m€\)](#)

This idea proposes the development of a series of enabling technologies to increase the performance and reliability of electrical components and optimise the efficiency of hydrogen-based propulsion system using superconductive power components. The proposed technologies will use cryogenic power conversion to minimize electrical losses, maximize power density and decrease the overall weight. The proposed synergies with the Norwegian innovation ecosystem can help accelerate the market uptake of the proposed clean technologies, also based on Norwegian ambition to facilitate the first zero-emissions flight before 2030.

# Call for Expressions of Ideas/Potential Members (CEI) NEXT and FINAL STEPS

- **Assessment summary report sent**
- **Finalisation of the list of potential “new” members**
  - ✓ **Assessment of their competences (done)**
  - ✓ **Assessment of the organizations’ operational capacity and realistic ability to contribute in the governance and the financial / in-kind contributions (done).**
- **Letters to potential members to exchange of information and possible finalisation of the MoU (to be sent by EC services)**
- **Exchange of information with the potential members willing to engage (by EC services)**
- **Feedback to Clean Aviation for WP preparation and eventually revision of the SRIA**

# Potential additional members

The approach to identify potential additional members for EPCA consisted in assessing the organizations participating in the CEI against this assessment criteria:

[#]	Criteria
C1	Additionality of the competence/contribution (technology and/or solutions from other sectors)
C2	Relevance of the proposed work (based on CEI assessment and measured against the high-level objectives for CA)
C3	Track record (as noted in terms of previous research, its impact and demonstrated innovation potential from R&I)
C4	Expected financial contribution (based on estimates provided – where existing, and typology/size of organisation)
C5	Breadth of participation (Place and country of establishment and link to MS support and synergies)

The outcome of the assessment is a total of some potential candidate organizations, which includes those participating in the seven short-listed ideas, as well as some other organizations from the non-short-listed ideas.

This selection has been done having in mind the call text and the potential added value of these organisations to achieve the objectives of Clean Aviation, the EGD.

The EC services with the support of the Joint Undertaking will further verify the potential members firm commitments, their potential in kind contribution and their alignment with the SRIA

# Potential additional members (Top 7 ideas)

Legal Entity	Country	Type of Organisation	Sector	Outcome
<b>CEA</b>	FR	RTO	ENERGY	to be contacted by EC services
<b>CERN</b>	CH	RTO	ENERGY	to be contacted by EC services
<b>HAI Hellenic Aerospace Industry SA</b>	EL	IND	AERO	to be contacted by EC services
<b>IAI Israel Aerospace Industries Ltd.*</b>	IL	IND	AERO	to be contacted by EC services (subject to association agreement)
<b>MT Aeropace</b>	DE	IND	AERO	to be contacted by EC services
<b>Sintef*</b>	NO	RTO	ENERGY	to be contacted by EC services (subject to association agreement)
<b>TU Delft</b>	NL	UNI	AERO	to be contacted by EC services
<b>Loccioni</b>	IT	IND	DIGITAL	to be contacted by EC services
<b>Sesta Lab</b>	IT	IND	TEST EQUIPMENT	to be contacted by EC services
<b>Absolut system</b>	FR	SME	ELECTRICAL COMPONENTS	to be contacted by EC services
<b>Aristotle University of Thessaloniki</b>	EL	UNI	AERO	to be contacted by EC services
<b>Bath University*</b>	UK	UNI	POWER ELECTRONICS	to be contacted by EC services (subject to association agreement)
<b>DeepConcept</b>	FR	SME	POWER ELECTRONICS	to be contacted by EC services
<b>EASN</b>	BE	Ass	AERO	to be contacted by EC services

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# Potential additional members (Top 7 ideas)

Legal Entity	Country	Type of Organisation	Sector	Outcome
<b>E-TDCs:</b> <b>European Technology Development Cluster</b>	IT -PL- DE- CZ	Cluster	AERO	to be contacted by EC services
<b>FIBRE Faserinstitut Bremen</b>	DE	RTO	MATERIALS	to be contacted by EC services
<b>Green laboratory</b>	FR	RTO	ELECTRIC MOTORS	to be contacted by EC services
<b>H.Munich</b>	DE	RTO	ELECTRICAL COMPONENTS	to be contacted by EC services
<b>INTA Instituto Nacional de Técnica Aeroespacial</b>	ES	RTO	AERO	to be contacted by EC services
<b>ISAE SUPAERO</b>	FR	UNI	AERO	to be contacted by EC services
<b>KIT</b>	DE	UNI	ELECTRICAL COMPONENTS	to be contacted by EC services
<b>NTNU*</b>	NO	UNI	ENERGY	to be contacted by EC services (subject to association agreement)
<b>OSWALD</b>	DE	IND	ELECTRIC MOTORS	to be contacted by EC services
<b>RISE SICOMP AB</b>	SE	RTO	STRUCTURES / MATERIALS	to be contacted by EC services
<b>Saab**</b>	SE	IND	AERO	<a href="#">to be contacted by EC services</a>
<b>Strathclyde University</b>	UK	UNI	POWER ELECTRONICS	to be contacted by EC services (subject to association agreement)
<b>TU Munich</b>	DE	UNI	ENERGY	to be contacted by EC services
<b>University of Stuttgart</b>	DE	UNI	AERO	to be contacted by EC services
<b>VESC</b>	DE	IND	ELECTRICAL COMPONENTS	to be contacted by EC services

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# Potential additional members (cherry picked) (1)

Legal Entity	Country	Type of Organisation	Sector	Outcome
<b>Air Liquide Advanced Technologies</b>	FR	IND	ENERGY	to be contacted by EC services
<b>Ariane Group</b>	FR	IND	SPACE	to be contacted by EC services
<b>Bosch</b>	DE	IND	Power Electronics	to be contacted by EC services
<b>Cranfield University*</b>	UK	UNI	AERO	to be contacted by EC services (Subject to association agreement)
<b>Infineon Technologies AG</b>	DE	IND	ELECTRICAL COMPONENTS	to be contacted by EC services
<b>Linde</b>	DE	IND	ENERGY	to be contacted by EC services
<b>Powercell</b>	SE	IND	ENERGY	to be contacted by EC services
<b>SAFT</b>	FR	IND	ENERGY	to be contacted by EC services
<b>Shell</b>	NL	IND	ENERGY	to be contacted by EC services
<b>Siemens Digital Industries Software</b>	DE	IND	DIGITAL	to be contacted by EC services
<b>SNAM</b>	IT	IND	ENERGY	to be contacted by EC services
<b>Solvay</b>	BE	IND	MATERIALS	to be contacted by EC services
<b>SOPRA STERIA</b>	FR	IND	DIGITAL	to be contacted by EC services
<b>Aéroports de Paris</b>	FR	Airport	AERO	to be contacted by EC services

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# Potential additional members (cherry picked) (2)

Legal Entity	Country	Type of Organisation	Sector	Outcome
<b>Ballard*</b>	CA	IND	ENERGY	to be contacted by EC services (Subject to association agreement)
<b>Bauhaus Luftfahrt</b>	DE	RTO	AERO	to be contacted by EC services
<b>KNMI</b>	NL	RTO	TEST EQUIPMENT	to be contacted by EC services
<b>Embraer</b>	PT	IND	AERO	to be contacted by EC services
<b>INDRA</b>	ES	IND	AERO	to be contacted by EC services
<b>Lilium GmbH</b>	DE	IND	AERO	to be contacted by EC services
<b>Politecnico di Milano</b>	IT	UNI	AERO	to be contacted by EC services
<b>Politecnico di Torino</b>	IT	UNI	AERO	to be contacted by EC services
<b>RWTH Aachen</b>	DE	UNI	AERO	to be contacted by EC services
<b>Sonaca</b>	BE	IND	AERO	to be contacted by EC services
<b>Technical University of Braunschweig</b>	DE	UNI	AERO	to be contacted by EC services
<b>TECNALIA</b>	ES	RTO	AERO	to be contacted by EC services
<b>Tecnam</b>	IT	IND	AERO	to be contacted by EC services
<b>University of Naples</b>	IT	UNI	AERO	to be contacted by EC services
<b>ZeroAvia*</b>	UK	IND	AERO	to be contacted by EC services (Subject to association agreement)

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Thanks and goodbye!

