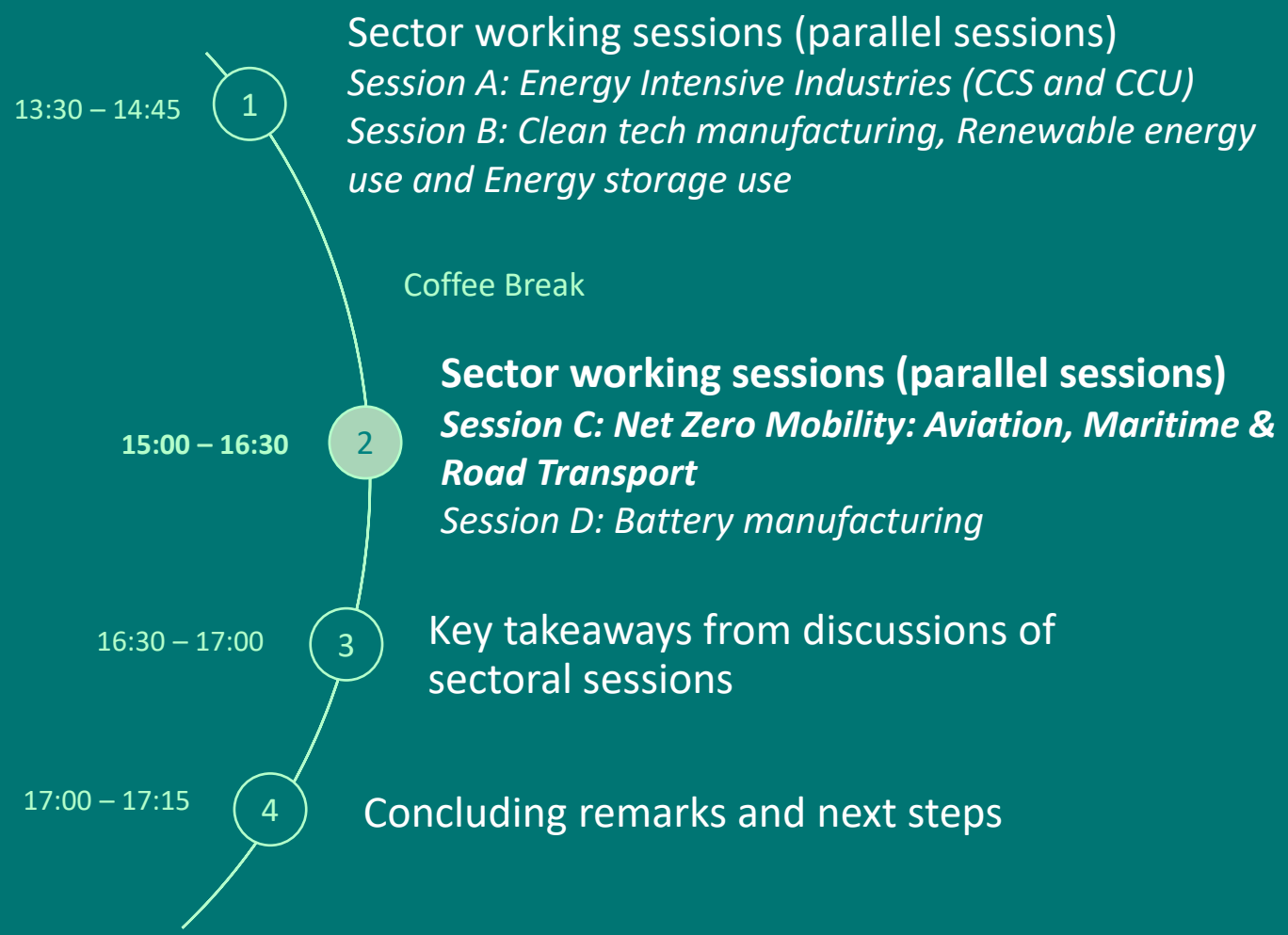
Session C: Net Zero Mobility: Aviation, Maritime & Road Transport

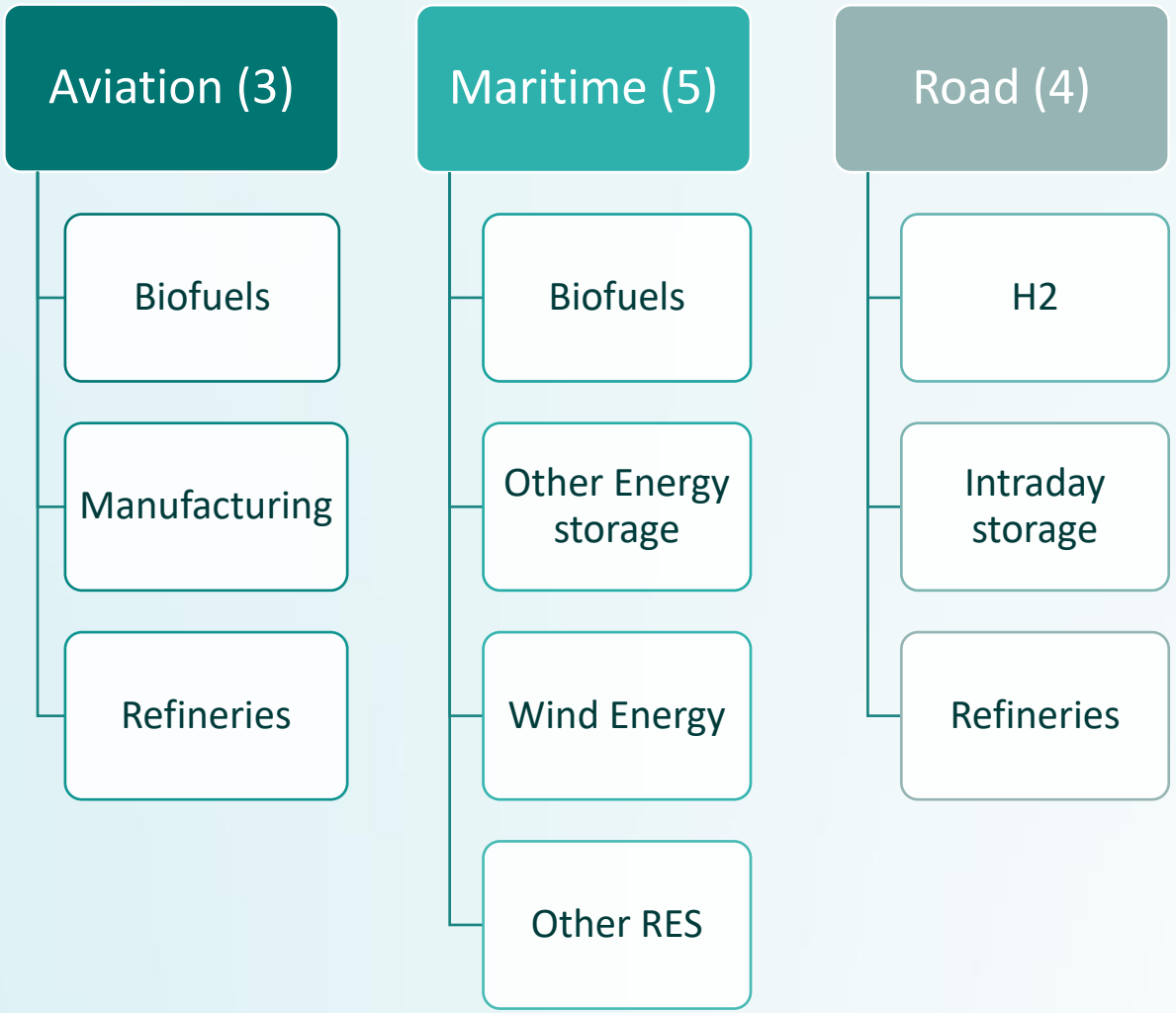


European Commission

Mobility

~16 Mt CO_2 eq
to be avoided*

Sector allocation of ongoing projects



The Innovation Fund is already supporting mobility projects

Projects are located in:
ES, NL, NO, SE, FI, FR

European Commission

Innovation Fund and the aviation sector

Polona Gregorin, DGCLIMA, Head of Unit - B.4 - Mobility (II): Air, Rail, Water and Intermodal Policy

European Commission

Aviation emissions – why do they matter?

- Total climate impacts of intra-European flights: 106-212 mio tonnes CO_2-equivalent (2023)
- 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.
- Climate impacts from aviation exceed the cumulative emissions of >150 countries.

Revision of the EU ETS

- **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-CO_2 effects** as from 2025

Supporting reducing overall climate impacts of aviation

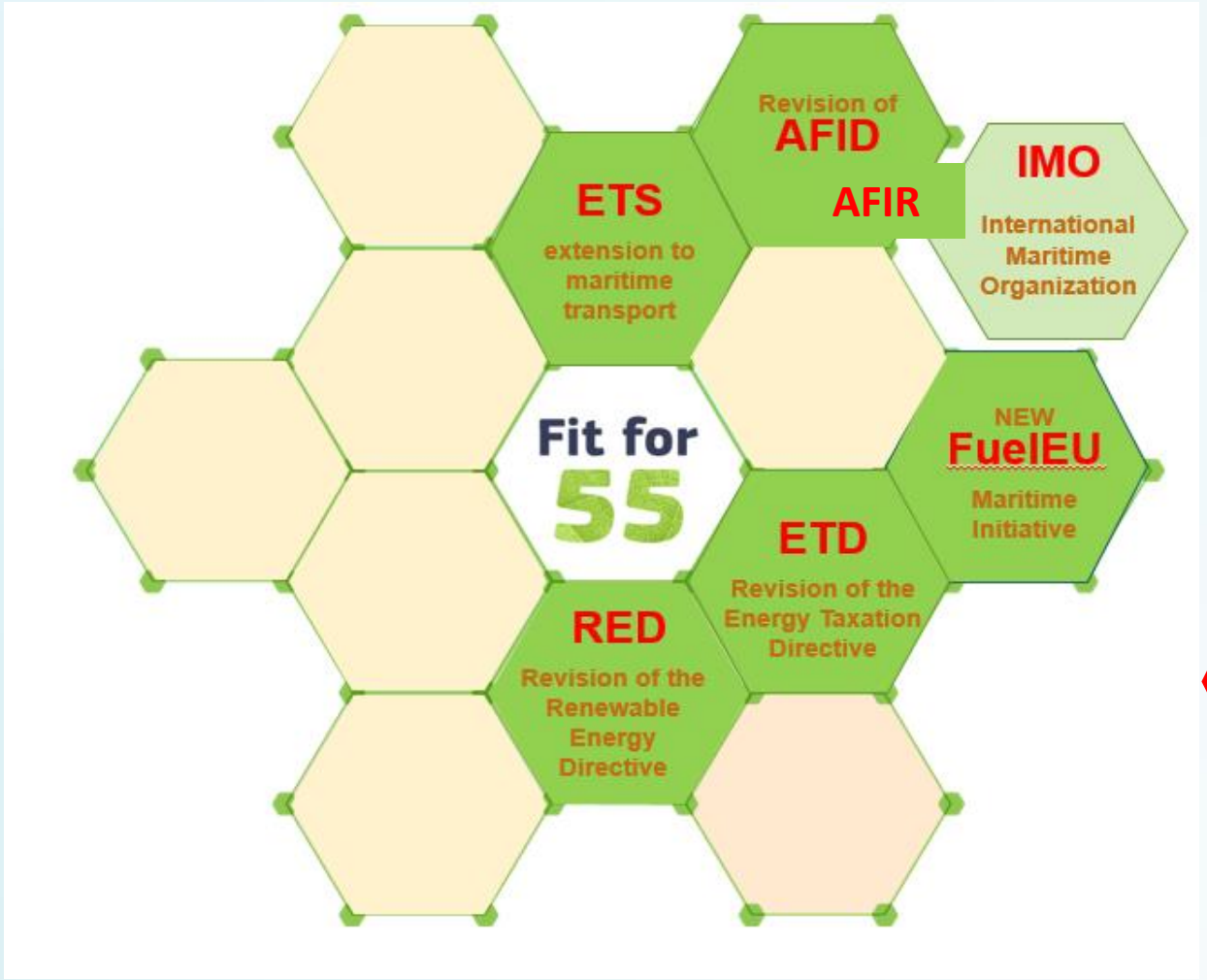
- **5 million allowances** added to the ETS Innovation Fund, where airlines and airports have always been eligible for support
- **EU ETS Innovation Fund** expansion to support the **electrification** of aviation and to address reductions of aviation's **full climate impact** (2-4 times CO_2 alone)
- Dedicated **GHG avoidance calculation, with non-CO2 impacts**

Innovation Fund and the maritime transport sector

Polona Gregorin, DGCLIMA, Head of Unit - B.4 - Mobility (II): Air, Rail, Water and Intermodal Policy

European Commission

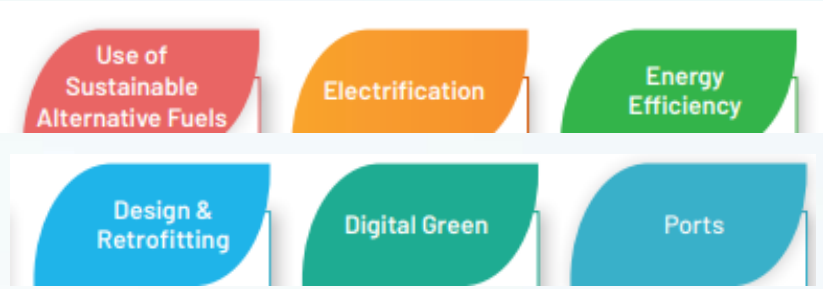
A basket of measures to address GHG emissions from shipping



Support measures

Innovation: e.g.

- H2020
- Innovation Fund



SRIA activities

European Commission

The ETS extension to maritime transport

- The existing EU ETS (Directive 2003/87/EC) covers **maritime transport emissions as from 1 January 2024.**
- **Same key principle as the other ETS sectors:** shipping companies monitor their emissions and purchase and surrender ETS emission allowances for each tonne of GHG emissions to be reported under the EU ETS.
- **Equal treatment** on routes, flag neutrality
- Builds on the already existing **monitoring, reporting and verification** of emissions (MRV Maritime Regulation)
- **Phase-in period** for 2024 and 2025 emissions (40% and 70%, respectively) and then full price signal as from 2026 reported emissions.
- **Innovation Fund**: increase of the size & special attention given to maritime; eligibility of projects with clear added value for the European Union.

Supporting the decarbonisation of shipping

- Special treatment of maritime projects in Call 2023 of the Innovation Fund
  - **Bonus point** for Maritime sector projects only: demonstrated potential to decarbonising the maritime sector and reducing its climate impacts.
  - Dedicated **GHG avoidance calculation**
  - When the projects concern **investments in ships**, those ships must call ports under the jurisdiction of an EEA country on a regular basis (at least **30% of their annual calls** on ports) or perform service or support activities in such ports.
  - When the projects concern **investments in ports infrastructure** the ports must be under the jurisdiction an EEA country.
  - **Shipbuilding**: only in EEA
- Preparing for **H2 Auction** 2024 with a dedicated basket for maritime

Policy developments in Road Transport

Carlo De Grandis, DG CLIMA, Policy Officer - B.3 - Mobility (I): Road

European Commission

Zero (tailpipe) emission road transport 1/2

Revision of CO2 emission standards for Cars (M1) & Van(N1)

55%

Cars emission reduction by 2030

50%

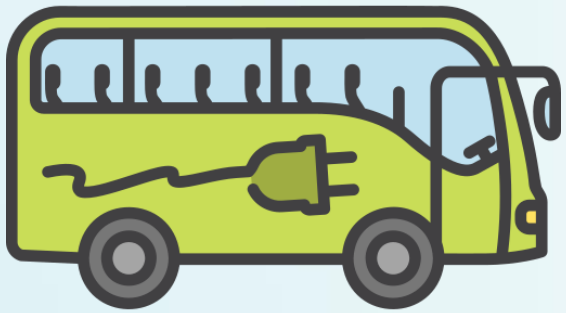
Vans emission reduction by 2030

100%

New vehicles to be ZEV by 2035

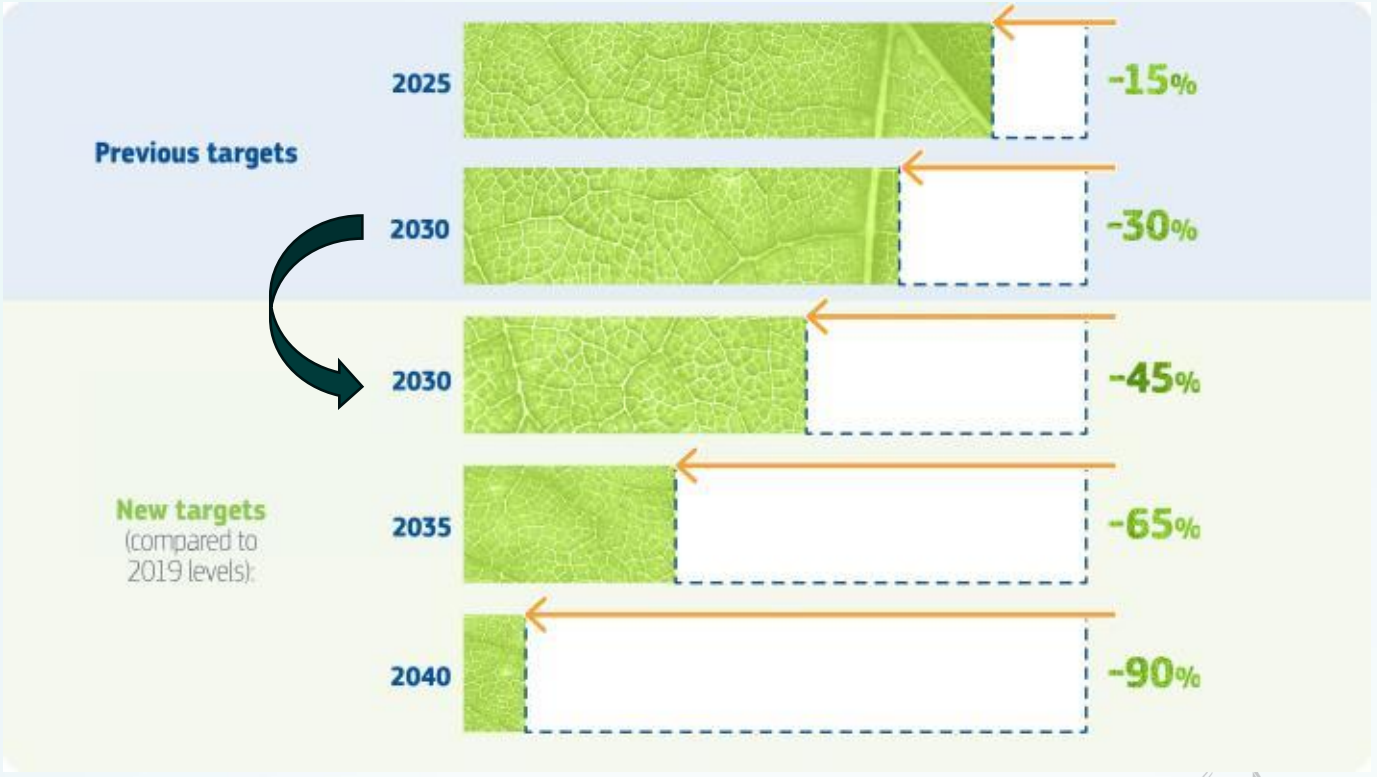
Zero (tailpipe) emission road transport 2/2

Revision of CO2 emission standards for buses, coaches and trucks (vehicles cat. M2, M3, N2, N3)



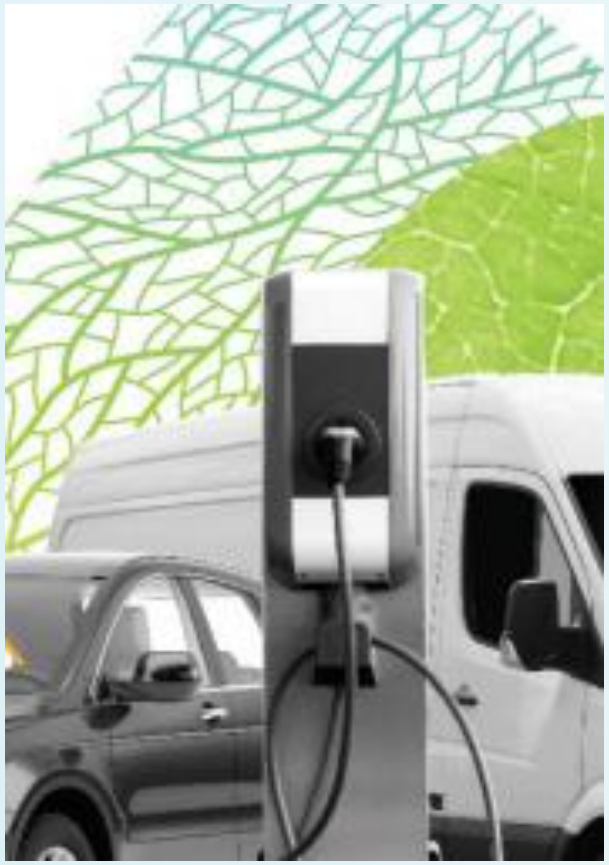
New urban buses to be zero-emission:

- **90% 2030**
- **100% 2035**



European Commission

Alternative Fuels Infrastructure Regulation (AFIR)



Public charging points Cars& vans:

- **Every 60 km max on** TEN-T network
- **Fleet-based target** (1.3 kW / EV)

HDV charging point

- **Every 60/100 km max on** TEN-T network,
- Safe & Secure Parkings
- TEN-T Urban nodes & multimodal platforms

HRS

- TEN-T network (200 km, 700 bar, 1 Ton)
- TEN-T urban nodes

- ❑ Roaming
- ❑ Price transparency (on-line)
- ❑ E-payments (“ad hoc payments”)

European Commission

Revision of the Energy performance of Building Directive (EPBD)
Electromobility & bikes/micromobility

- N. **Charging Points**, **Ducting**, Cabling per building (new / restructured / public buildings
- **Smart-charging** / bilateral charging-ready
- Parking & chargers for e-bikes/carbo bikes / micromobility
- **Right to Plug**
  - Eased public Permitting (including safety / fire prevention)
  - ~~veto~~ by co-dwellers / owners

European Commission

Q&A Section

European Commission

Innovation Fund – Stakeholder insights – Maritime Sector

CLIA, ECSA, ESPO, SEA Europe & Waterborne TP

Fanny Lossy, European Community Shipowners' Associations (ECSA), Director

European Commission

The following presentation should serve as an indicator of what is known that the sector is developing right now. The technologies and timelines stated have not been academically or scientifically validated. Not all individual stakeholders may have been consulted resulting in a list of recommendation that cover a majority view based on the experience of the five associations involved in the development of this presentation. This presentation is not intended to be used as prediction for the pathway until 2050, but instead should showcase what are most – likely, known options for the purpose of designing funding options that match these immediate needs.

Disclaimer

Cruise Lines International Association (CLIA), European Community Shipowners Association (ECSA), European Sea Ports Organisation (ESPO), Shipboard and Maritime Equipment Association of Europe (SEA Europe), European Research and Innovation Platform for Waterborne Industries (Waterborne)

European Commission

Overview of the sector

Cargo, Passenger & Offshore Vessels

- *Short Sea Shipping and Deep-Sea Shipping*
- 23.000+ vessels (EU only)
- 39% of the world's fleet

Our key concern is the **lack of availability of renewable and low carbon fuels at commercial scale and at an affordable price**. **R&D, innovation and deployment** of these fuels and propulsion technologies on board vessels is key.

Maritime Cruise

- *400+ vessels ranging from 150 to 6000+ passengers*

Cruising has **not committed to one single fuel** option and keeps research, trials, testing and investment focused on a **variety of different energy sources**.

Maritime Infrastructure & Logistics

- *300 Maritime Ten-T ports (+ hundreds of non-Ten-T)*
- *800+ terminals*

Production, import, export and distribution of fuels are **logistically handled** through a **network** of ports, requiring ports to reshape the port area and adapt their infrastructure.

Maritime Shipbuilding & Equipment

- *150+ shipyards, 60 billion turnover*
- *6% global market share / 35% for marine equipment*
- *A world leader in technology*

The **Energy Efficiency potential** from one generation of ship to the next one is **a double-digit percentage**. The effect of a reduction of total cost of ownership, due to efficiency, in the value chain is enormous.

Planned pipeline of innovative projects

Refitting

- Immediate focus on **Energy Efficiency design** solutions with a strong drive towards using **drop-in fuel** option in current engines. **Fuel Cell technology** is at an early stage.
- **Multi-fuel engines** are being refitted when commercially viable.

New Build

- **Multi-fuel engines** are being installed.
- **Drop in Fuels** remain high on the agenda with **Fuel Cell technology** being at its beginning.
- **Methanol** is a viable option with **Ammonia** becoming increasingly interesting.
- **Electricity** for Short Sea shipping and Ferries are tested at scale.
- **Wind and Hydrogen** have potential once efficiency increases.
- **Carbon Capture** needs a regulatory and research framework. An increased safety risks remains a concern.
- **Hydrogen and H2-based fuels** have the potential to support transition on certain maritime segments.

Electrification

- Development and upscaling of **Onshore Power Supply installations** for providing electricity to ships at berth, allow for battery charging or **battery swapping**, integrating Onshore Power Supply into overarching **port electrification**
- Development of smart **energy grids, microgrid solutions** and **storage capacity**.

Bunkering Infrastructure for new Fuels

- Extensive infrastructure development to **bunker fuels with lower energy density, higher storage capacity need** and higher **safety risks**

Carbon Capture, Usage and Storage

- Storage facilities
- Pipelines

Greening of Port operation

- Development and retrofitting of port equipment propelled by renewable fuels; optimize refuelling solutions

European Commission

Technology Readiness Level (TRL) of envisaged projects

TRL, Efficiency and Choice
Although options exist, several challenges hinder the production and fast deployment of renewable and low carbon fuels, for example feedstock availability, fuel storage & bunkering, and onboard energy storage & safety.

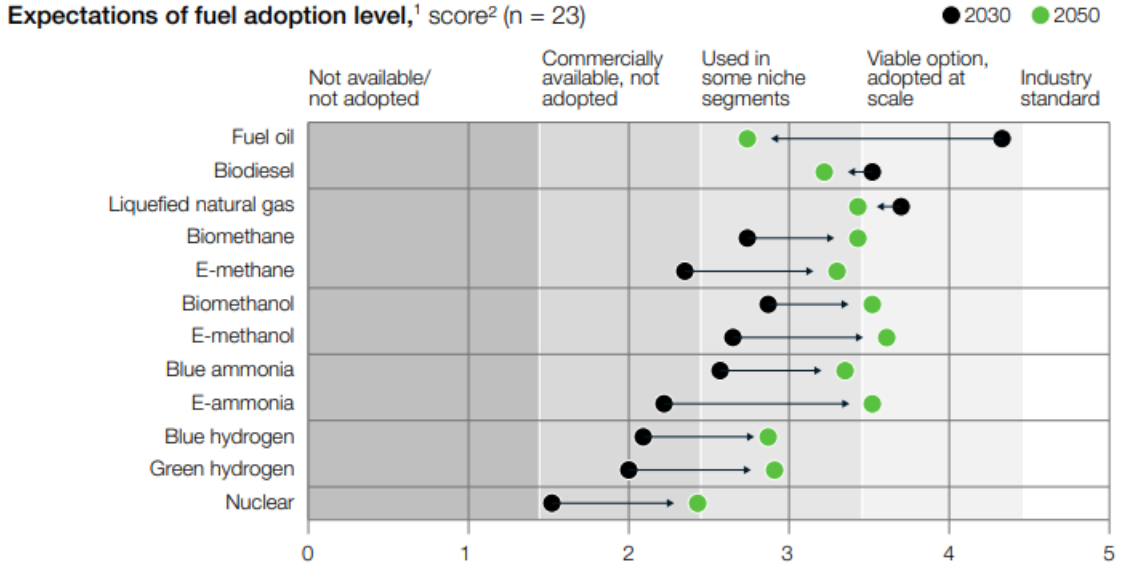
TRL 6-9 → *TRL 3-5*

Energy Efficiency focus on technology enhancement in hull and propulsion design; digitalization, route adjustment, Onshore Power Supply, use of renewable energy sources(e.g., wind assisted propulsion), alternative energy sources for certain ship types.

Multi–Fuel Engines with LNG, bio-diesel, methane, methanol.

Renewable and Low Carbon Fuels liquified synthetic methane, green methanol towards hydrogen using fuel cell technology; carbon capture; batterie technology; hydrogen as fuel.

Shipping company respondents expect fossil-based fuel oil to remain industry standard in 2030 but foresee no industry standard by 2050.



[1]Question: What is your expectation of the industry's adoption of the following fuels?
[2]Scored from 0 to 5, where 0 is no adoption and 5 is total adoption.
Source: Survey of shipping companies conducted October–November 2022

April 2023 - Reference: https://cms.zerocarbonshipping.com/media/uploads/documents/The-Shipping-Industrys-Fuel-Choices-on-the-Path-to-Net-Zero.pdf

European Commission

Examples of types of support required

It is important to consider that multiple technologies may be installed on one ship – funding calls need to allow for a multitude of technologies on one vessel

Project	CAPEX	OPEX	Most suitable EU fund
Increasing production of renewable and low carbon fuels dedicated to the maritime sector	Grant for CAPEX for research, installation, deployment; scaling up the production	Auction Mechanism, such as (Carbon) Contract for Difference to lower the price gap between conventional and RLCF to ensure uptake and secure production; Price cap on fuel, initial funding for fuel uptake	Innovation Fund
Onshore Power Supply installation for ship to shore electricity connection, recharging of batteries and wider energy grid connection	Grant for CAPEX for the installation and grid infrastructure	Funding for OPEX for tax restriction on electricity	Innovation Fund CEF / AFIF
Port Infrastructure and equipment (Bunkering of renewable fuels, deployment of smart & efficient refueling solutions)	Grant for CAPEX for research on strategic need within TEN-T; Installations	Funding for OPEX for operation in accordance to new safety requirements	Innovation Fund AFIF /CEF /Horizon
Refitting or New Building of vessels with multi fuel engines	Grant for CAPEX for technology and equipment and retrofitting	Funding for OPEX: Price cap on fuel, initial funding for fuel uptake	Innovation Fund Invest EU Programme
Vessel design (including safety aspects due to new fuel, hull design, energy density and distribution requirements)	Grant for CAPEX for the installation and upgrade; New build program	Funding for OPEX for the loss of onboard space or insurance cost.	Innovation Fund Horizon Europe
Battery Technology – Electrical Storage	Grant for CAPEX for technology, equipment and retrofitting	Funding for OPEX for tax restriction on electricity, funding for price stability	Innovation Fund EU Investment Fund
Fuel Cell Development and Deployment	Grant for CAPEX for research, deployment and installation using multiple source fuels	Funding for OPEX to fund price stability of initial fuel source	Innovation Fund EU Investment Fund
Waste to Energy	Grant for CAPEX for research and development to create Business Case; Installation	Funding for OPEX for compounding deployment or waste reception facilities	Innovation Fund Horizon Europe
Carbon Capture, Usage and Storage	Grant for CAPEX for research, development, installation, infrastructure	Grant for OPEX for Usage, sealing and continuous monitoring	Innovation Fund EU Investment Fund
Energy Efficiency / Digitalization	Grant for CAPEX for new Build program for all types of vessels	Grant for OPEX to upgrade and integration of digital network	Innovation Fund Horizon Europe

Size and amount of financial support required

The Innovation Fund calls should continue to cover the **three categories of:**

- **Small-scale projects,**
- **Medium-scale projects and**
- **Large-scale projects.**

Consideration should be given to include dedicated calls in all three categories. The multitude of actors in this sector is diverse in size, capability and geographical distribution, resulting in the need for different sizes of funding opportunities.

The variety of the sizes of projects are showcased in the appendices.

The following figures cover only some segments of the value chain. The financial support needed to decarbonise the entire maritime sector is much higher.

Estimated Financial Support needed:

- **€9.9 billion** will be needed for the alternative fuel infrastructure (€2.5 billion for hydrogen infrastructure & €7,4 billion for OPS)

- **€20 billion** will be needed to decarbonise port managing bodies for investments related to the energy and sustainability transition according to the ESPO Port Investments Study 2024.

- Funding to bridge the immense price gap between conventional and renewable low carbon fuels. **Renewable low carbon fuels are currently up to 4 to 5 times more expensive than conventional fuels.**

European Commission

References: https://www.europarl.europa.eu/RegData/etudes/ATAG/2022/729395/EPRS_ATA(2022)729395_EN.pdf

Conclusions and recommendations

Fuel

- **Bridge the price gap** between conventional and renewable and low carbon fuels. Renewable and low carbon fuels currently cost up to 4 to 5 times more than conventional fuels.
- **Fund R&D** and innovation projects for renewable and low carbon fuels and propulsion technologies considering **operational and critical safety issues** associated with the supply and use of renewable and low carbon fuels.
- **Fund the scaling up and deployment** of renewable and low carbon fuels and propulsion technologies on board vessels (for example via Contract for Difference).

Ship

- Keep supporting **Energy Efficiency** measures also enabled by digital technologies
- Support for **Drop-in-fuel deployment** and usage
- Uptake of **Onshore Power Supply**
- **Deployment of a prototype** such as Fuel Cell and Carbon Capture trial
- **First industrial deployment** for Fuel Cell, Carbon Capture and Multi fuel engines; renewable and low carbon fuels such as Hydrogen (retrofitting and newbuild program)
- **Electrification** of Short Sea Shipping, Inland Waterways and Ferries

Infrastructure (and logistics)

- **Strong focus on RFNBO** production (quantity) import, export, storage, economic viability (price) and availability (infrastructure)
- Deployment and upscaling of **Onshore Power Supply** installations for charging and operation in port including
- **Carbon Storage facilities**
- **Greening of Port operation** support the deployment of and RD&I into the use of port equipment propelled by renewable fuels as well as smart refueling solutions. (including supply chain optimization)

Conclusions and recommendations

The projects selected under the Innovation Fund 2023 call are not known yet, but some elements should be taken into consideration for the next call:

Dedicated calls for maritime needed as a prerequisite for **decarbonising** the sector:

- Comprehensive maritime **supply chain approach**, both ship and shore (infrastructure) side, is needed.
- Crucial to **bridge the immense price gap** between renewable and low carbon fuels and fuels currently used.

Criteria of the IF calls should be improved and **targeted to the needs of all segments of the maritime sector** (for ex: short- and deep-sea shipping, SMEs). For example:

- The **EU-added value criteria** should be tailored to the maritime sector.
- The criteria of **30% port calls** in the EU is not fit for all the shipping segments.
- Criteria are needed to **scale-up the availability of renewable and low carbon fuels** at commercial scale.

Support needed for:

- projects, which are proven **highly effective in terms of emission reduction** and overall climate impact, and which must be improved and/or scaled up through further innovation.
- **First applications** to ensure EU leads market competitiveness and industrial capacity

- The **bonus point** for the maritime sector is welcome, but it may not be enough to help maritime projects.
- Applications to the Innovation Fund calls should be **less complex and burdensome**.

European Commission

Appendices

Sample Projects currently under development as presented during the Innovation Fund InfoDay on 1 February 2024

Project Submission

Current Call IF23

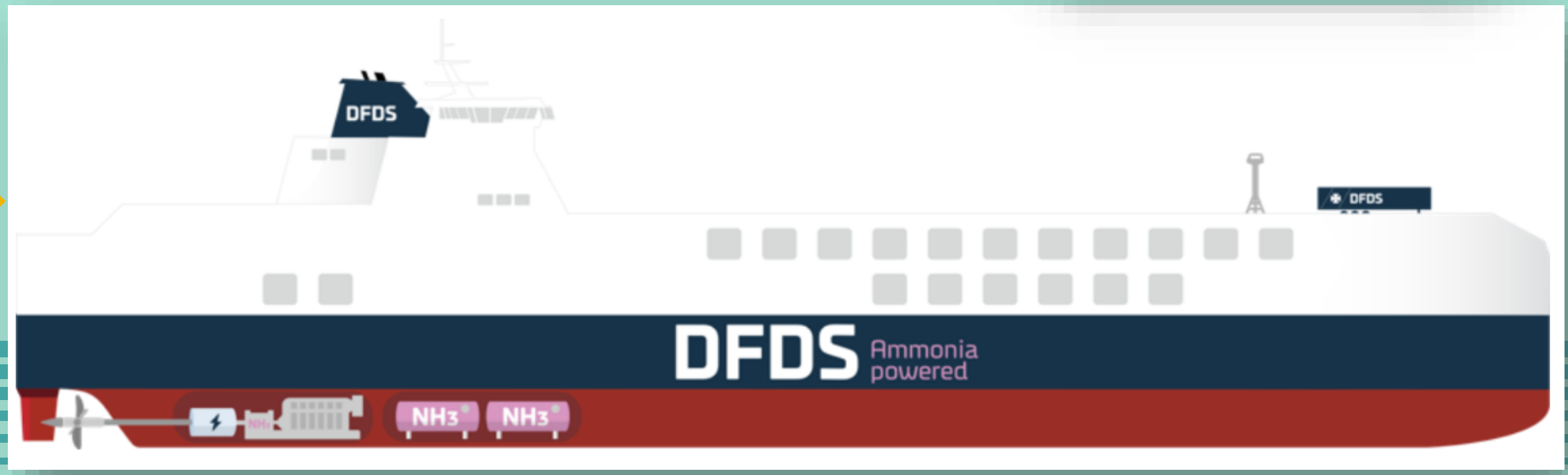
European Commission

Presented by: Dominic Tasker, Senior Manager Decarbonization for Princess, Holland America, Seabourn and P&O Australia

Project 1: Cruise Vessels and Methanol

Presented by Lau Blaxekjær, Head of Decarbonisation Funding, DFDS

Project 2: DFDS on ammonia powered RoRo vessels



Presented by: Pablo Campos-Ansó Fernández, Innovation Development Manager,
G. Junquera Marítima

Project 3: G. Junquera Maritima on Ballast-free cargo ships

Presented by: WENCHE H. ANDERSEN, Kongsberg Maritime AS

SEA Europe
Shipyards' & Maritime Equipment Association

Project 4: Kongsberg learning journey with EUIF

Pipeline

Current or future

European Commission

Presented by: Mathieu Petiteau, New Building Director and R&D at Ponant Cruises

Project 5: Wind Assisted Propulsion

SWAP2ZERO

Sustainable - Wind Assisted Propulsion – Zero Emission Ready

Presented by: Marjon Castelijns, Project Leader Condor H2

Project 6: Zero Emission and Port Infrastructure

Presented by: Ukko Metsola, Vice President Government Relations at Royal Caribbean Group

Supported by:

Project 7: Carbon Capture and Fuel Cells

Innovation Fund – Stakeholder insights – Aviation Sector

Laurent Donceel, *A4E*
Francois Collet, *Airbus*

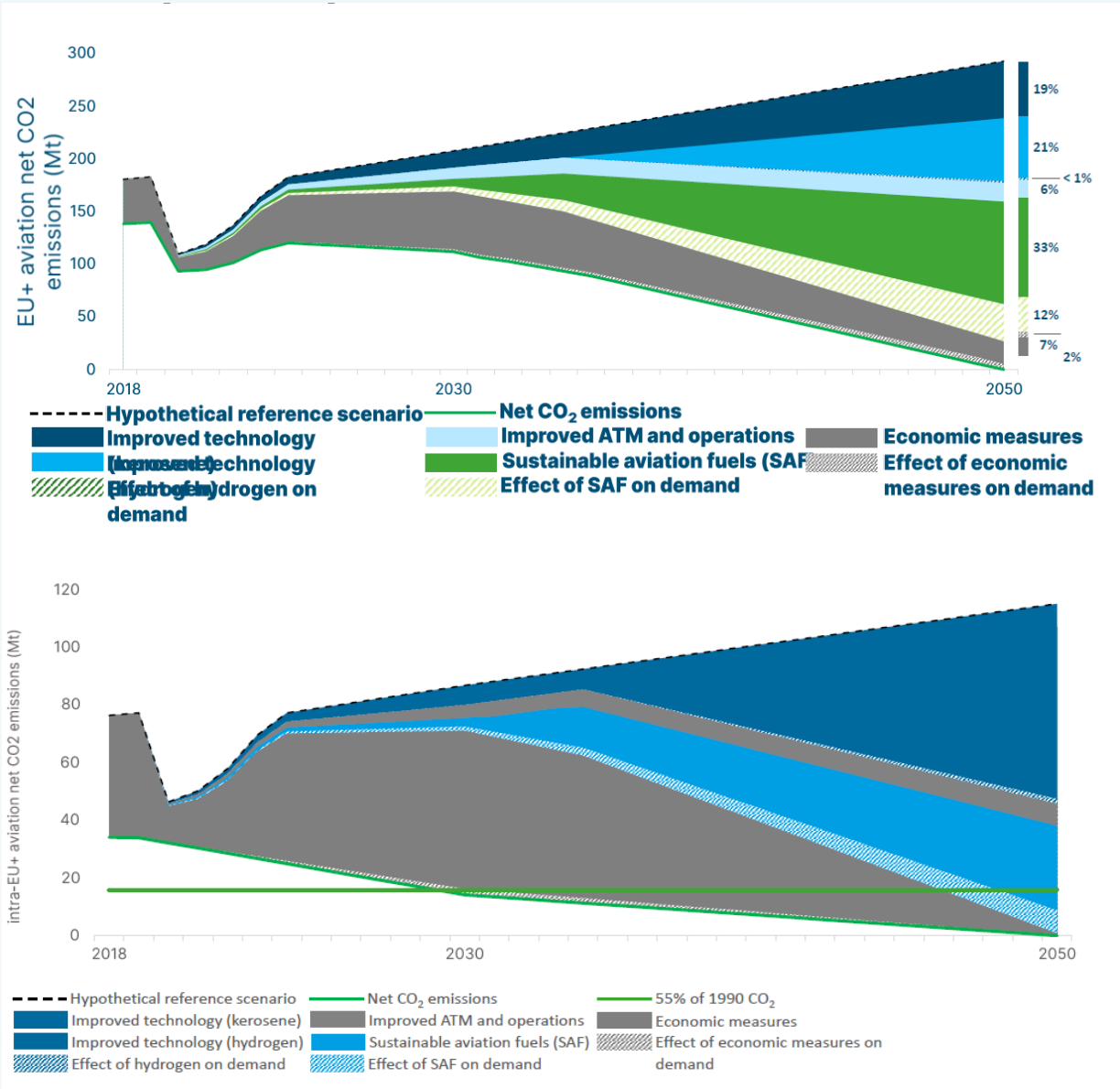
European Aerospace, Security and Defence industry, ASD
Airlines for Europe, A4E

European Commission

Overview of the sector and innovative technologies

- Sustainable Aviation Fuels (RLCFA)
  - As per ReFuel EU. Min 6% SAF target, incl 2% RFNBOs to abate est. **8 Mt CO2** annually by 2030.
  - To be delivered at Union Airports: **2.7 Mtoe** of SAF (SAF production capacity in 2020 in the EU around 0.24 Mtoe = 9%)

- Novel aircraft and engine technologies (AZEA)
  - Electric and hydrogen propulsion
  - Could abate up to **1,6 Mt** of CO2 annually on intra-European routes by 2030. 43 Mt by 2050
  - -31% of intra-European aviation emissions by 2050



Commission

Planned pipeline of innovative projects

- Timeline for SAF projects are anywhere from **2 to 6 years** between investment date and production
- SAF project challenges are the **lack of EU financial support scheme** (beyond the potential Innovation Fund)
- eSAF and PtL challenges are the **cost of production** (energy-based cost)
- US is very supportive of SAF production; no auction or deposit requirements
- EU may become the largest importer of SAF

Type of support required

The development and construction phases of industrial-sized projects typically last five to seven years. Urgent expansion of the sustainable liquid fuel project pipeline is therefore needed to provide sufficient supply and meet the EU decarbonisation targets for 2030. To expand the pipeline of viable projects, projects under development need to be matured through holistic de-risking mechanisms to rapidly achieve financial investment decisions.

"Financing sustainable liquid fuel projects in Europe", EIB May 2024.

(…) Higher production costs compared to fossil fuels mean that biofuels are not yet economically viable and need policy measures to support production. (…) deployment of these fuels has been slower than expected. The main barriers are lack of investment security, high costs, and scaling-up issues.

"The EU's support for sustainable biofuels in transport", European Court of Auditors (ECA) Special report 29/2023

- Move from budget/grant allocation → to financial guarantee approach
- Auctioning and deposit requirements are a real constraint for start-up, SMEs
- EU or state guarantee supporting project debt financing (similar to export credit structure) would be highly beneficial
- Assignability of EU subsidies (grants or tax credits) to financiers would enhance financeability of projects
- Project sponsors and advisory banks currently "stuck" by the lack of the above schemes

Case studies

- Iceland eSAF project: 65 tons of eSAF annually
- Green hydrogen with captured CO2
- Phase II financing round
- $35m needed for development, then 800$m for full scale
- $18m needed immediately to:
  - Establish an SPV for the development and construction of the eSAF facility
  - Complete Front-End Engineering to reach FID
  - Expand capabilities/staffing to manage increased project scale
  - Secure long-term revenue streams and off-take agreements
- All of the above needed to apply to the Innovation Fund and put down deposits to participate to the auction
- Chicken & egg situation

Recommendations

- Significant absolute GHG emission reductions from Aviation will happen not with one aircraft but **at fleet level**. Bringing tangible evidence of GHG avoidance at fleet level is part of the difficulties to meet Fund award criteria and is not compatible with the projects' execution timeline. An explicit recognition of these **fleet impacts** which bring high alignment to the replicability award criterion would be beneficial.

- The high **relative GHG emission** avoidance threshold is a major hindrance for Aviation to apply to the Fund, given the most likely short to medium term innovations in technologies and fuels. This constrains applications with absolute GHG emission reduction in-class with existing large-scale applicants. The guarantees of GHG avoidance are not always in the hands of the technologies and future product developers: They depend on **operators**, SAFs availability and maturity of hydrogen-based concepts.

- Further clarification on the benefit of projects that **implement bio-based/other SAF** with other technologies at fleet level is important. Further that the challenges of SAF availability are recognised within a potential new approach to considering relative GHG emissions being shaped to be more realistic relative to the benefits that can occur in absolute GHG emissions.

Recommendations

- The Fund should be flexible enough to recognise innovation also on **component level**, as long as the innovation fits the Fund's purpose, i.e. contributes significantly to decarbonisation.

- The **project maturity evaluation** should acknowledge and accommodate Aviation constraints and consider within the development-to-operation phase the integration aspect of each technology onto a final product (aircraft, or at least major component or system e.g. engine, wing, fuselage, major system) and the timelines induced by regulation, qualification and certification constraints for the introduction into operation of a new technology.

- The reality of Aviation innovation cycles are not considered: **Adaption, flexibility, and equity** for applicants in the same category would be welcome. Dedicated calls and an adapted Fund framework incl. terms and conditions for Aviation could be also an option to accommodate sectoral specificities.

Conclusions

- Emission reductions from aviation will happen **at fleet level, over long term** (in line with execution of projects);
- Emission reduction will depend on **adoption of innovation by operators, availability of SAFs and maturity of H2-based concepts;**
- Aviation has **longer timelines,** induced by regulation, qualification and certification for the introduction of new technology;
- Recognition of **innovation at component level** would trigger significant action and projects towards decarbonization;
- Considering all EU REDII SAF production incl. **“traditional pathways” like HEFA, ATJ and FT** is key for emission reduction;
- Specific **financial support for small and mid size companies** needed : auction mechanism and deposits are constraints to innovation; auctioning not suitable;

Innovation Fund – Stakeholder insights – Road transport Sector

Benjamin Krieger, CLEPA, Secretary General

European Commission

To decarbonise road transport, all viable technologies are needed

Battery electric, including plug-in hybrid (BEV + PHEV)

- Zero tailpipe emissions
- Cost and utility advantages in many vehicle segments
- Beneficial for certain light commercial vehicle use cases (e.g. local delivery)
- Commercial applicable, **but further cost cut potential of 50%**
- Suited to certain heavy-duty vehicle segments (municipal vehicles, regional delivery)
- Some highly-predictable long-haul use-cases

Hydrogen fuel-cell (FCEV)

- Zero tailpipe emissions
- Hydrogen provides longer range and shorter refuelling times
- Option for passenger car segments requiring long range and fast refuelling
- Most suitable for low to medium load commercial vehicle operation
- Enables long range vehicle operation
- Range and fast refuelling beneficial for many professional use cases where constant vehicle operation required

Hydrogen internal combustion engine (H2ICE)

- Virtually zero / zero-impact tailpipe emissions (=“ZEV”)
- Similar advantages to FCEV
- Most suitable for high load operation (commercial vehicles)
- Lowest additional vehicle cost
- Mature technology using existing supply chain – ready for volume production
- Minimal critical raw material use
- Maintains existing facilities and employment
- Enables volume production in near-term ➔ provides demand for refuelling infrastructure for benefit of FCEV

Race to 2035/2050 is about decarbonization, but also about competitiveness, ensuring production takes place in Europe

Overview of the sector and innovative technologies

Enabling Co2 reduction in vehicles

Battery electric vehicles will require further optimization of cell chemistry, electric propulsion technologies and thermal management.

Fuel cell electric vehicle would allow quicker charging and longer range, may be in particular suitable for long-haul heavy-duty applications.

Hydrogen combustion build on European strengths and existing infrastructure; complementary technology to decarbonize fleet and heavy duty.

Leading edge components for affordable mobility, accelerate the product development cycle to cut cost of leading-edge components in half, improve energy efficiency and reduce Co2 footprint. What took four generations for ICE components, should be done in two generations for EV components.

Enabling Co2 reduction in manufacturing

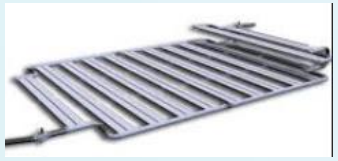
Electrically Excited Synchronous Motor (**EESM**) with hairpin stator, electric motor without rare earths. 30% less Co2, 30% more power density

REASSERT: Fraunhofer Institute for Manufacturing Engineering and Automation IPA are working alongside industry partners to pursue various concepts for repairing, remanufacturing and reusing electric motors and new designs for the circular economy.

Green hydrogen could be used to replace gas in industrial processes, for instance for the production of aluminium wheels or glass.

Overview of the sector and innovative technologies

E-axle: allowing cars to run longer, using less electricity.



Thermal management: improve battery range (up to 20%), extend lifetime, accelerates charging time.

Innovation in cathode active materials and cell chemistry can bring down costs & improve vehicle performance

Power electronics: efficiency gains through controller, converter, on-board charger, …

Hydrogen storage systems: securing sufficient payload and storage for heavy duty.

Further development of components crucial to optimize performance of (fuel cell) electric or hydrogen combustion vehicle

Planned pipeline of innovative projects

Leading edge component development accelerator:

- Previous activity: Optimisation of of fuel injector (Gen1→Gen4) took more than 20 years and 4 generations
- Planned activity: Scale-up of manufacturing for volume production and know-how. Optimisation of inverter, e-motor, power electronics should must be cut in half, focus on reduction of cost, energy intensity production, reduction material use
- Timeframe: 2024-2034

H2ICE hydrogen injector production scale-up :

- Member States: France
- Previous activity: R&D completed/ongoing, pilot line constructed, proof of concept completed
- Planned activity: Scale-up of manufacturing for volume production
- Timeframe: Start of production 2027-

Type of support required

Industrialisation grants to enhance competitiveness:

- Mix of CAPEX and OPEX support
- Grant funding for industrialisation is essential to ensure the EU is a competitive investment destination
- The availability of industrialisation grants is a decisive factor in the decision making if the other factors are in balance
    - Automotive suppliers compete in a global landscape
    - Investments are directed where they bring the highest return
    - Investment decisions are made based on many factors: availability and cost of land & facilities, skills, cost of employment, availability and cost of (green) energy, proximity to markets.
    - Create a level-playing field regarding massive subsidies in US/China, e.g. IRA
- Increase complexity of optimising production at existing facilities, OPEX support can enhance competitiveness of existing production footprint

Size and amount of financial support required

- **Completely new investment (new facility and plant), e.g. EV battery:**
  - Total investment: high x00,000,000
  - Grant support: low x00,000,000

- **Conversion of existing facilities to new products, e.g. ICE to e-axle, e-motors etc:**
  - Total investment: low x00,000,000
  - Grant support: low-high x0,000,000

- **Conversion of existing facilities to similar products, e.g. ICE to H2ICE:**
  - Total investment: mid-high x0,000,000
  - Grant support: low x0,000,000

- **Fasttrack optimisation and industrialisation of leading-edge components**
  - Total investment: x00,000,000 (e-motor, inverter, onboard chargers, converters)
  - Grant support: low x0,000,000

Case studies

French supplier invested over €250 million and intends to employ over 600 people for the first mass production plants of hydrogen storage tanks for mobility applications in Europe. Production started in 2023. Company is supporting workforce in the transition from exhaust systems to hydrogen storage through proactive training and requalification programs.

A German supplier is together with a regional Government in an active cooperation to convert an ICE facility towards e-mobility. Due to the lack of support tools for the necessary technological ramp-up for e-mobility mass production – replacing ICE product lines with eVD product lines – the main focus lies on employee reskilling and greening of the facility. Similar use cases we find across the whole Automotive Regions Alliance, where we see no lack of political commitment to support the transformation (including budgets), but missing support tools that target the scaling up of this technology pathway.

Innovation Fund could help derisk investments and accelerate the industrialization of latest innovations.

Conclusions and recommendations

- Innovations of automotive suppliers are essential to reduce road transport emissions and achieve FF55 and net-zero goals, support needed to accelerate deployment of key components which are decisive for environmental performance (optimization of performance, range and efficiency of vehicle).
- Co2 reduction in hard to abate sectors also depends on design innovations in use sectors
- Support for all net-zero-viable propulsion technologies is needed – battery electric, hydrogen fuel cell, hydrogen ICE
- Obtaining funding is challenging and uncertainty about volumes is undermining business case to industrialise production of electric propulsion and hydrogen technologies in Europe
- Industrialisation grants enable production investments to be made in the EU instead of other global regions
- The scope of the Innovation Fund clean manufacturing call should include components of all the above technologies in its scope

Q&A Section

European Commission

Discussion Section

Laura Pereira, ICF, Energy, Climate and Sustainability Expert

European Commission

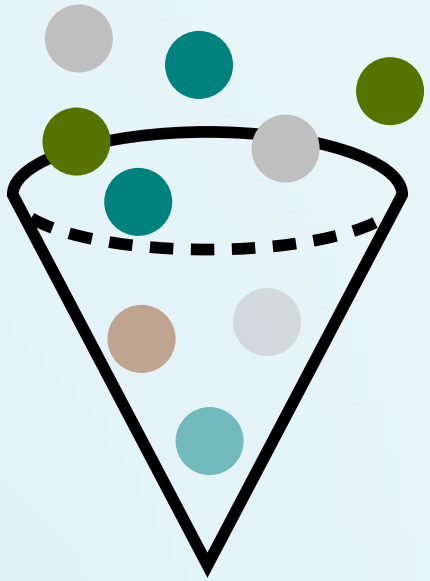
We want to hear your views and your experience

1. Do you consider the creation of a single GHG mobility section beneficial for your sector?

2. Should emissions from the supporting infrastructure be included in the boundaries of the calculation?

3. What have been the most relevant changes in the market conditions during the last year? Which sectors were affected the most? Which types of support have proven to be particularly successful?

Do you consider the creation of a single GHG mobility section beneficial for your sector?



GHG emission avoidance = **Reference scenario emissions** - **Project scenario emissions**

$$\Delta GHG_{abs\ mob} = \sum_{y=1}^{n} Ref_{FF,y} + Ref_{nonCO2,y} - \sum_{y=1}^{n}\sum_{t=1}^{T}(Proj_{FF,t,y} + Proj_{bio,t,y} + Proj_{res,t,y} + Proj_{elec,t,y} + ProjH_{2,t,y}) + ProjnonCO_{2,y})$$

(example for illustrative purposes only)

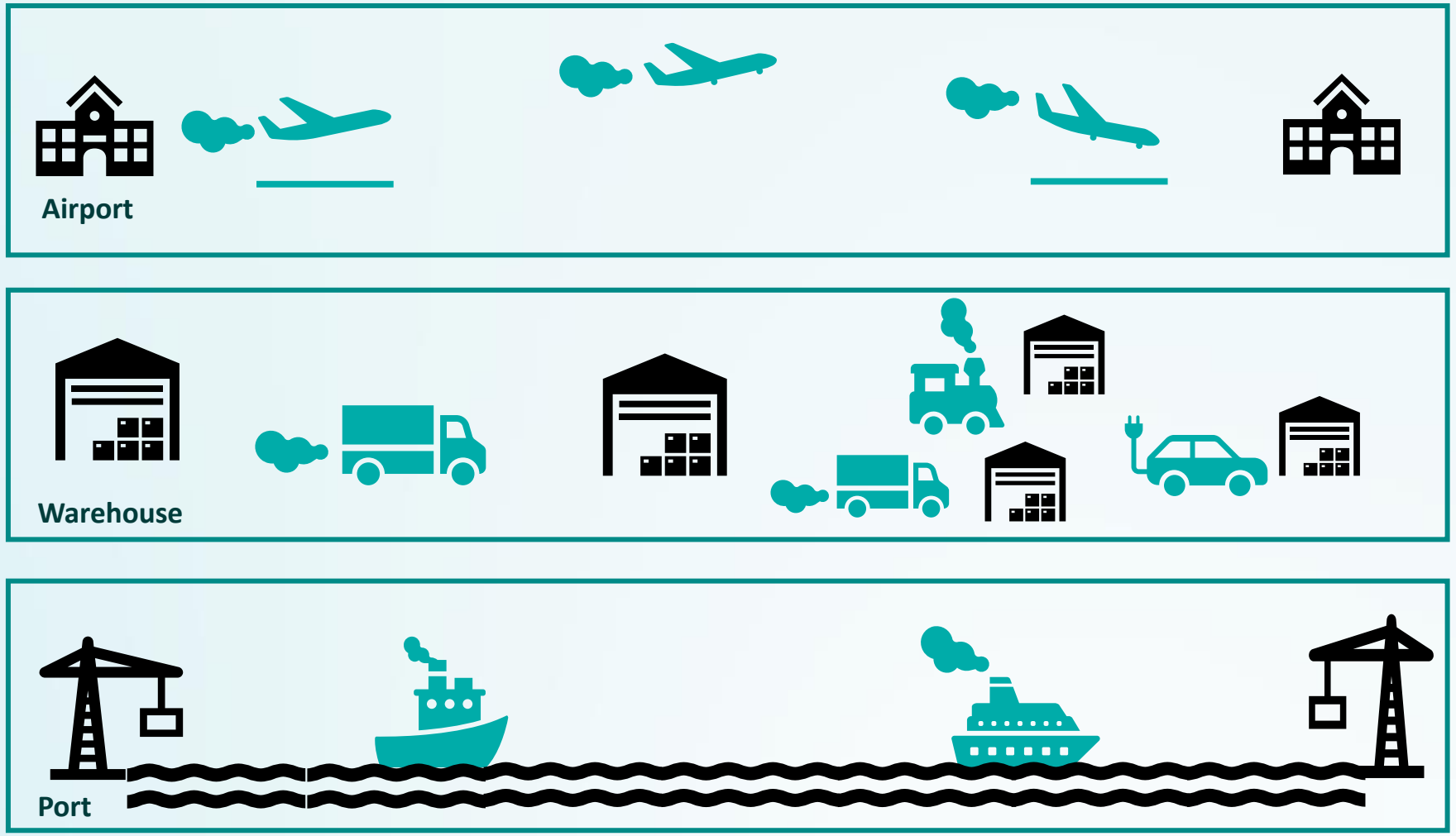
What does this mean for the sectors?

PROS: One multi-model that accommodates all possible combinations of modals and fuels, resulting in more flexible baselines

CONS: Reduced default provisions and a potential need for changes in resubmissions

European Commission

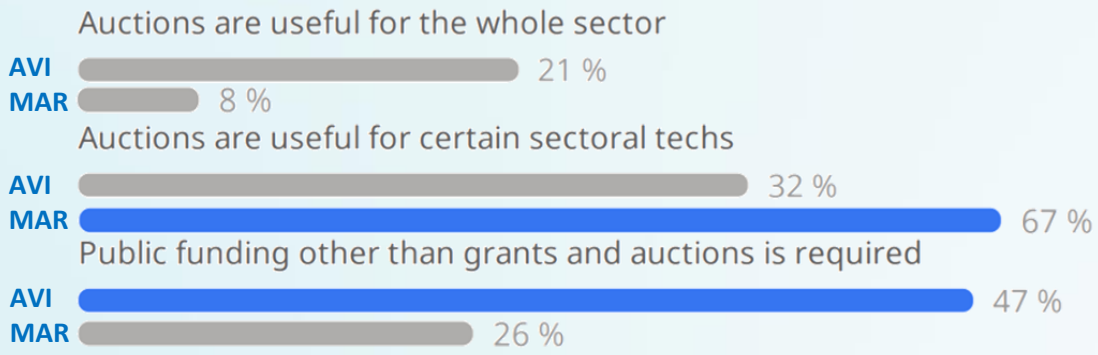
Should emissions from the supporting infrastructure be included in the boundaries of the calculation or just those from the journeys?



What have been the most relevant changes in the market conditions during the last year? Which sectors were affected the most? Which types of support have proven to be particularly successful?

In last year's consultation you answered…

"which areas would benefit from auctions? Other funding measures required?"



Slido Poll

1. Do you consider the creation of a single GHG mobility section beneficial for your sector?
2. Should emissions from the supporting infrastructure be included in the boundaries of the calculation?
3. What subsector are you from?

slido

Join at

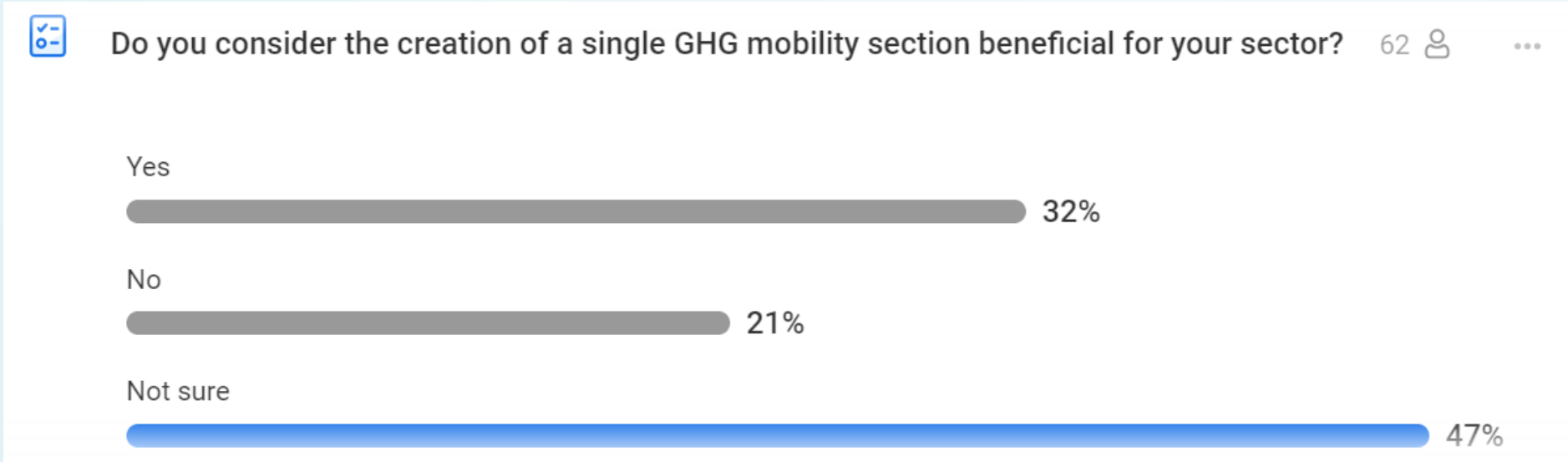
slido.com

#WGBC

European Commission

Slido Poll Results

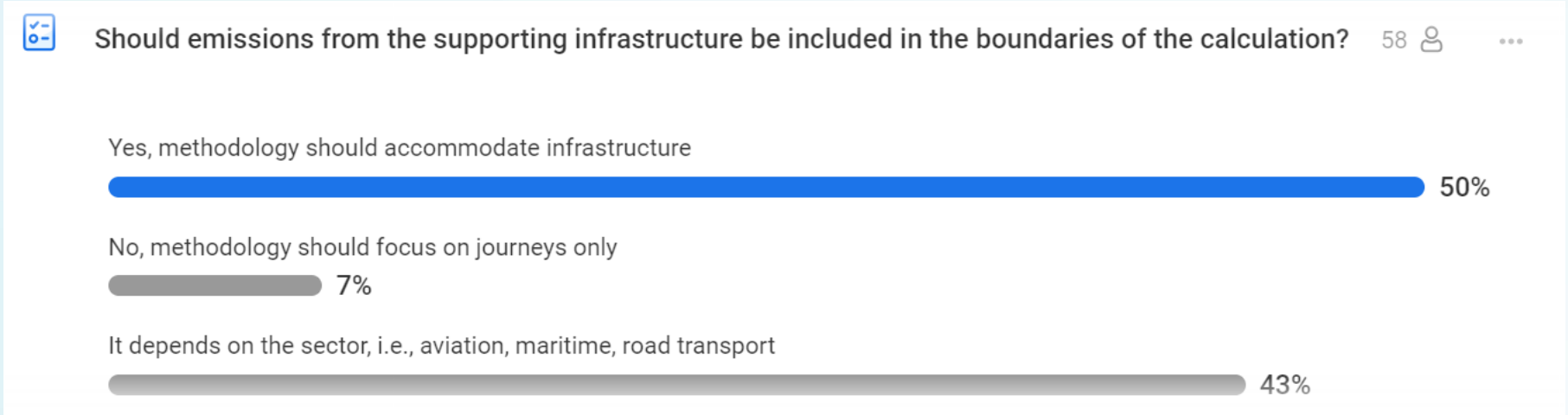
1 Do you consider the creation of a single GHG mobility section beneficial for your sector?



European Commission

Slido Poll Results

2 Should emissions from the supporting infrastructure be included in the boundaries of the calculation?

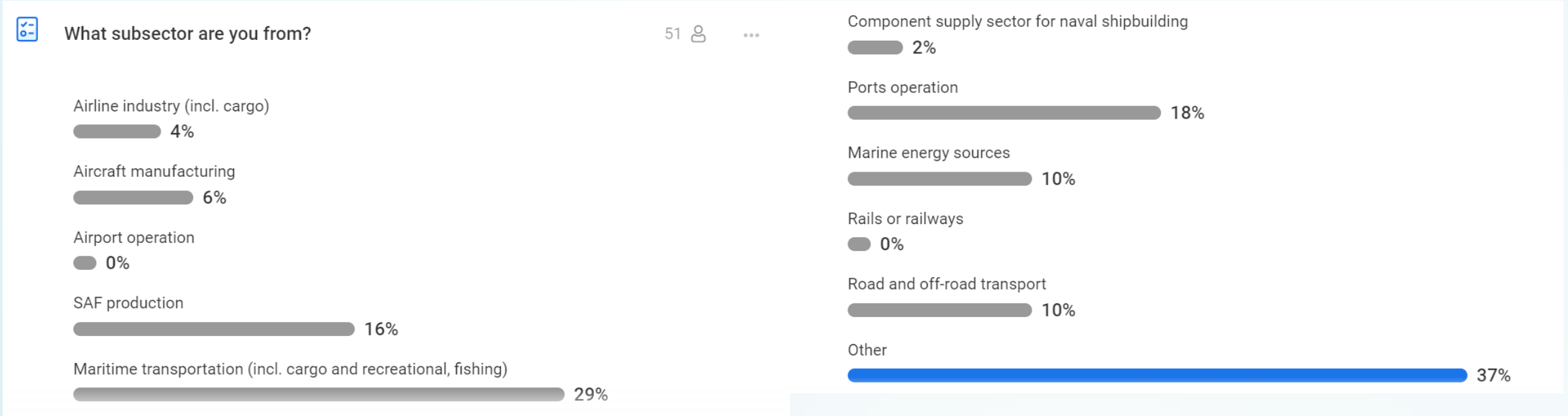


European Commission

Slido Poll Results

3

What subsector are you from?



European Commission