Session B: Clean tech manufacturing, Renewable energy use and Energy storage use

13:30 – 14:45 (1)

Sector working sessions (parallel sessions)

Session A: Energy Intensive Industries (CCS and CCU)

Session B: Clean tech manufacturing, Renewable energy use and Energy storage use

Coffee Break

15:00 – 16:30 (2)

Sector working sessions (parallel sessions)

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

Session D: Battery manufacturing

16:30 – 17:00 (3)

Key takeaways from discussions of sectoral sessions

17:00 – 17:15 (4)

Concluding remarks and next steps

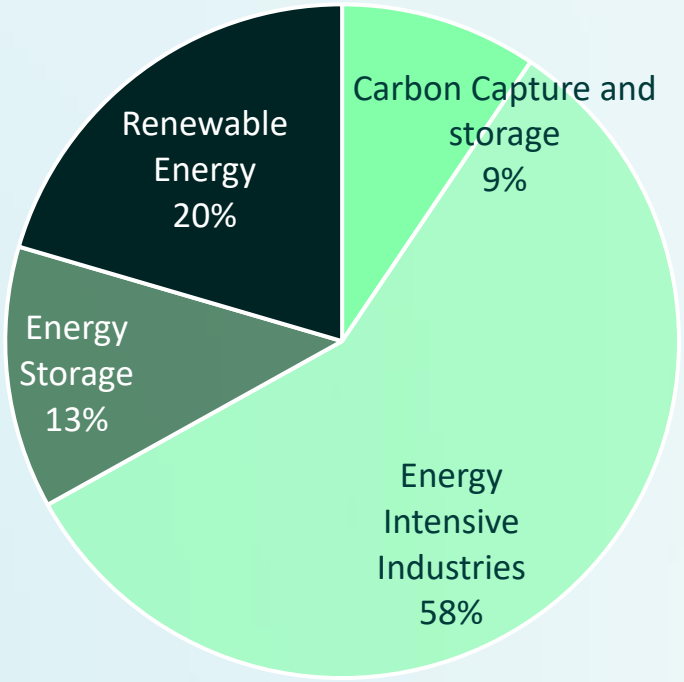
European Commission

Innovation Fund portfolio by

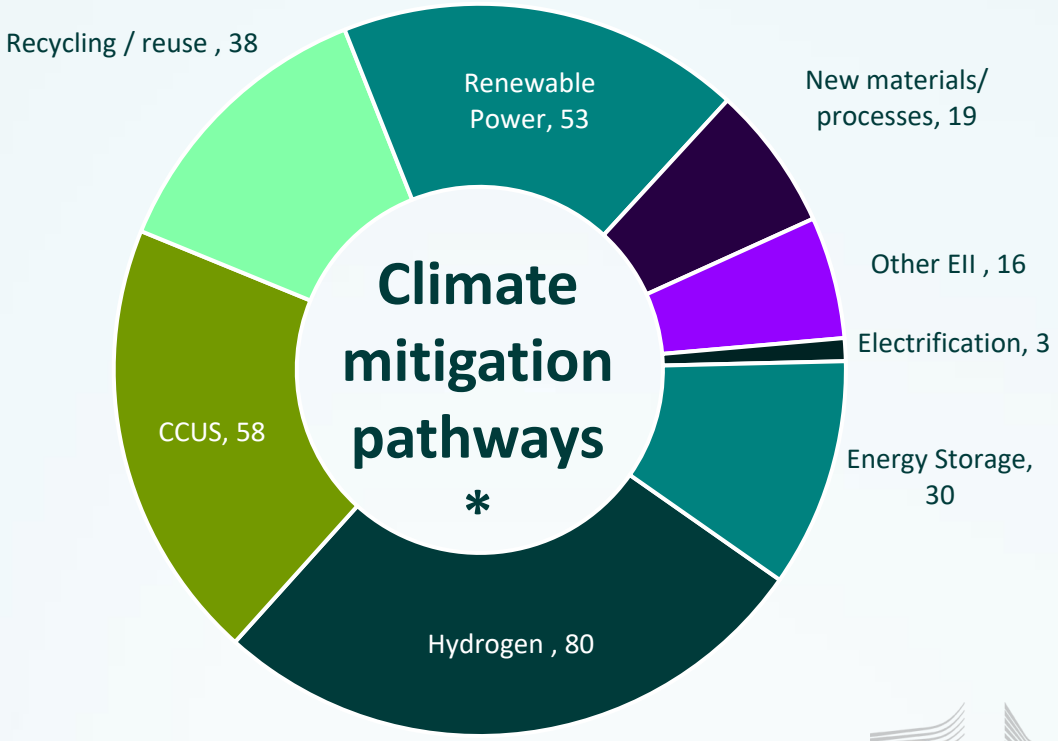
Climate mitigation pathways

Climate mitigation pathways describe the innovative technologies implemented by the projects leading to GHG emissions avoidance. A project can have one or several pathways

Projects by category



Climate mitigation pathways



*The climate mitigation pathways describe the technology of the projects leading to GHG emissions avoidance. A project can have one or several pathways

European Commission

Cleantech: Renewables and Energy Storage

~153 Mt CO_2 eq to be avoided*

Climate mitigation pathways* implemented by IF projects in the Renewable and Energy storage category

Renewable Energy (39%)	Energy storage (33%)	Manufacturing of components (15%)	Other (9%)	Recycling (4%)
• Solar • Wind • Ocean • Geothermal • Bio-based • Heating/Cooling	• Electricity • Thermal / Heat • Other (P2X) • Hydrogen for transport applications	• Energy storage • Renewables • Electrolysers	• Other • Electrification	• Batteries

*The climate mitigation pathways describe the technology of the projects leading to GHG emissions avoidance. A project can have one or several pathways

Clean tech manufacturing, Renewable energy use, and Energy storage use

Jacek Truszczynski - DG GROW, Deputy Head of Unit - I.3 - Green and Circular Economy

European Commission

Q&A Section

European Commission

Innovation Fund – Stakeholder insights

Anett Ludwig - SolarPower EU, Head of Supply Chains
Patrick Clerens - EASE, Secretary General

European Commission

Innovation Fund – Stakeholder insights

SolarPower Europe
Solar PV

European Commission

Planned pipeline of innovative projects

- **Project pipeline, by technology type and Member State:**
  - Perovskite (Oxford PV in Germany, Voltec in France)
  - Tandem silicon (3Sun Gigafactory in Catania/Italy)
  - Topcon (Carbon and Holosolis in France, FuturaSun in Italy)
  - IBC (Meyer Burger until recently, FuturaSun, Carbon)

- **Insights on forecast entry into operation:**
  - Carbon and Holosolis entry into operation in 2025
  - 3Sun Gigafactory expanding operation in summer 2024
  - Oxford PV bringing perovskite to market in 2024
  - Futurasun entry into operation is planned in 2027

- **EU / MS support schemes that are helping the generation of potential future projects:**
  - Horizon Europe
  - EIT Innoenergy
  - European Innovation Council
  - Recovery and Resilience Facility (Italy, France, Spain, Germany)
  - European Investment Bank
  - Temporary Crisis and Transition Framework

Type of support required

- For the project pipeline mentioned, provide indication of the types of support that would be most suitable (grants, auctions, financial instruments or other) and explain why
    - **Grants are the preferred financial mechanism:** They offer more flexibility to investors. Grants de-risk programs by reducing the amount of funds that need to be borrowed, thereby impacting risk and interest rates.
    - **OPEX support for long-term bankability:** Any form of operational expenditure (OPEX) support is beneficial due to high energy prices and component costs, which account for more than 80% of the product cost.
    - **Potential insurance fund:** This fund will help de-risk projects until they are able to enter the market.
    - **SolarPower Europe proposes a Solar Manufacturing Facility (SMF)** integrated into the Innovation Fund, similar to the Hydrogen Bank. The SMF should target state-of-the-art innovative solar systems – that meet NZIA resilience) with high efficiency levels to ensure Europe invests in scaling up innovative solar supply chains. **SolarPower Europe calculated that €7.8 billion in funding over 10 years** would be needed for the EU to initiate the construction of at least 10 GW of solar manufacturing capacity, on the way to achieving 30 GW by 2030.

Conclusions and recommendations

- What would you like to see changed? What kind of change would you want us to advocate for?
  - **Better support to scale up while supporting existing solar manufacturing in the EU:** Simplify procedures, as the current "cascade" evaluation approach does not meet the needs of the EU PV industry. Support is needed for producing standard products to keep the few companies in the European supply chain operational.
  - **Rethink the Innovation Fund design:** Create two separate calls—one for carbon capture technologies and one for renewable technologies and storage—that genuinely reduce carbon emissions.
  - **De-risk** project investments as much as possible.
  - **Improve allocation of funds:** The conditions to obtain funding, as seen in the Meyer Burger example, are very complex. The PV industry has less flexibility and visibility on Innovation Fund payback compared to other industries. Since the money granted through the fund is linked to the project's production, the risks become higher.
  - **Set up a Solar Manufacturing Facility within the Innovation Fund:** Extend the example of the Hydrogen Bank and "Auction as a Service" to drive initial scaling while simultaneously supporting existing EU production. Channel Innovation Fund resources efficiently through a competitive bidding auction.
  - **Reduce** the consumption of raw materials.

Innovation Fund – Stakeholder insights

Ocean Energy Europe
Ocean Energy

European Commission

Overview of the sector and innovative technologies

- **Reflections on the sector**
  - Tidal and wave technologies are fully within the innovation fund's scope with many technologies having demonstrated **at full-scale prototypes and now seeking finance for farms**
  - Europe is the global leader, but large funding is fuelling increasing competition from the US & China
  - The next IF call is an opportunity to support the Commission's **ocean energy target of 1 GW by 2030** set out in the EU Offshore Strategy and boost Europe's competitiveness

- **Types of innovation, beyond commercial state-of-the-art that could benefit from support**
  - Tidal Stream and Wave energy technologies
  - Latest studies show that there is at least **80 GW of tidal and wave practical potential in EU waters** + 50 GW in the UK
  - Ocean energy technologies are highly modular and inherently scalable with strong new market creation potential in Europe and export opportunities beyond.
  - To date, 100% of the content of ocean energy projects is manufactured in Europe

- **Main bottlenecks for these new technologies to reach pre-commercial status**
  - Cost of capital is the main challenge

Planned pipeline of innovative projects

- **Project pipeline, if available, by technology type and Member State**
  - 137 MW publicly supported tidal and wave energy pre-commercial projects in Europe to be deployed by 2028
  - Much more mature projects with permitting/consenting that have not yet received funding
  - In France, the President announced tidal commercial calls — the sector is asking for 250-500 MW by 2028
- **Are there any EU / MS support schemes that are helping the generation of potential future projects?**
  - EU/MS grants + national revenue support systems

Type of support required

- A mix of **EU grants + national revenue support mechanisms** with an earmarked budget for ocean energy.
- **Cost of capital is the main bottleneck to ocean energy scale up**. Interests/dividends requested by investors can represent **up to 50%** of total project costs. Grants are the easiest and fastest way to lower the cost of capital.
- Public funding is needed to create a business case and attract private investors.

Case studies

- FR gov provided a financial package to the **17.5 MW tidal pilot farm 'FloWatt'** including a grant of **€65M** + a feed-in tariff that acts as a premium to cover the cost of innovation.
- UK CfD earmarked budget for tidal unlocked **93 MW of tidal farms** in 2 auction rounds & attracted investments from EU countries and the US.

Size and amount of financial support required

- **CAPEX needed to realise the project pipeline**:
  - €500-700M CAPEX for pilot projects after prototype until 2026
  - €1-2bn CAPEX for pre-commercial projects beyond 2026
  - At project level: **€40-150M CAPEX** for pilot projects and more beyond

- **Other EU funding streams that could be used**
  - **EIB guaranteed loans** to reduce the high financial risk premium of innovation and make projects bankable via cheaper debt
  - **Insurance Fund** to cover technical risks and lower OPEX
  - Horizon Europe

Conclusions & recommendations

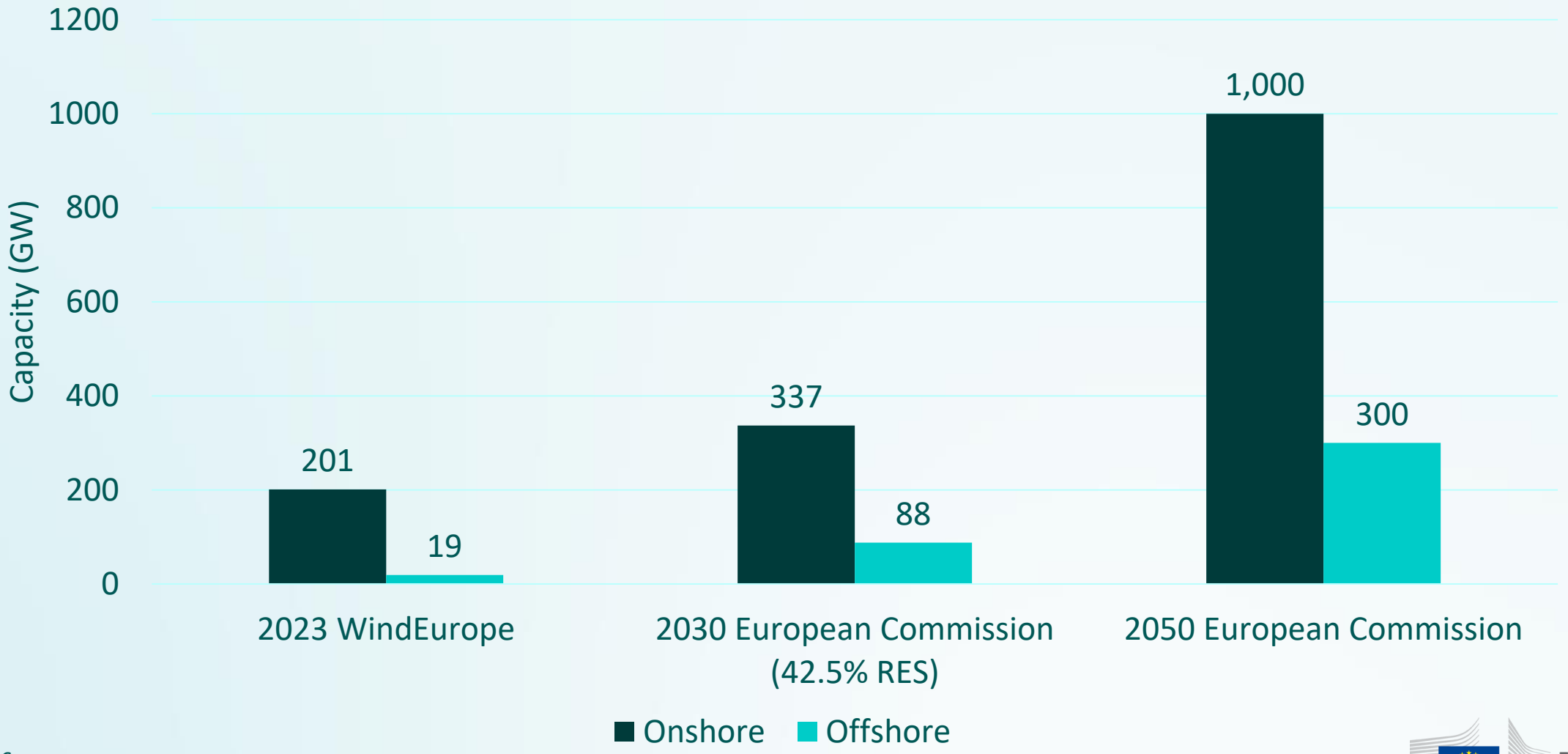
- **The 'Pilot Projects' window must be made permanent**.
  - It's the only instrument that covers the funding scheme gap between Horizon Europe and pre-commercial projects for highly innovative technologies.
- Eligibility criteria must be **100% clear** to applicants

Innovation Fund – Stakeholder insights

Wind Europe
Wind Energy

European Commission

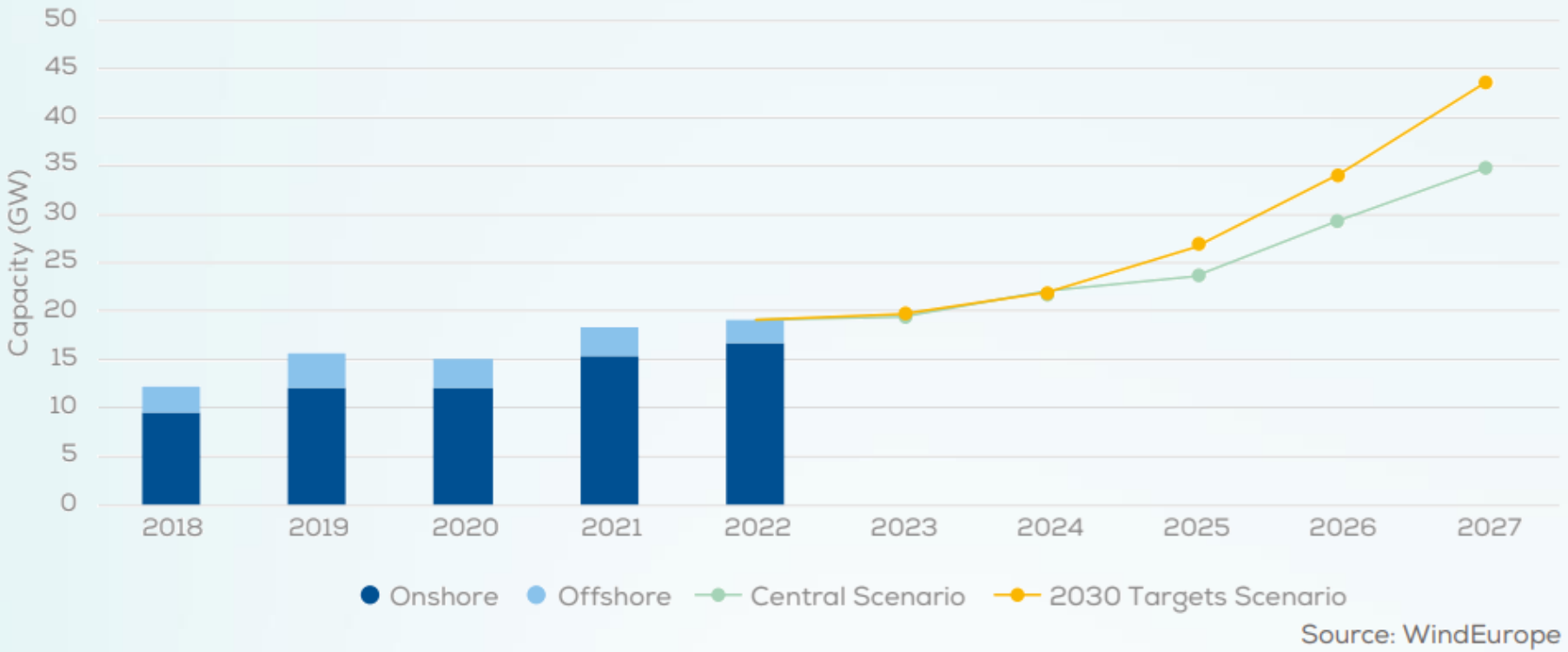
Huge increase in wind capacity coming



EU-27. Source: WindEurope, 2030 & 2050 EC ALLBNK (2030 Impact Assessment)

Europe must step-up annual installations to deliver targets

- Innovation across the value chain is cornerstone to reach EU targets
  - Faster deployments
  - More annual energy production
  - More reliable wind power



Source: WindEurope

European Commission

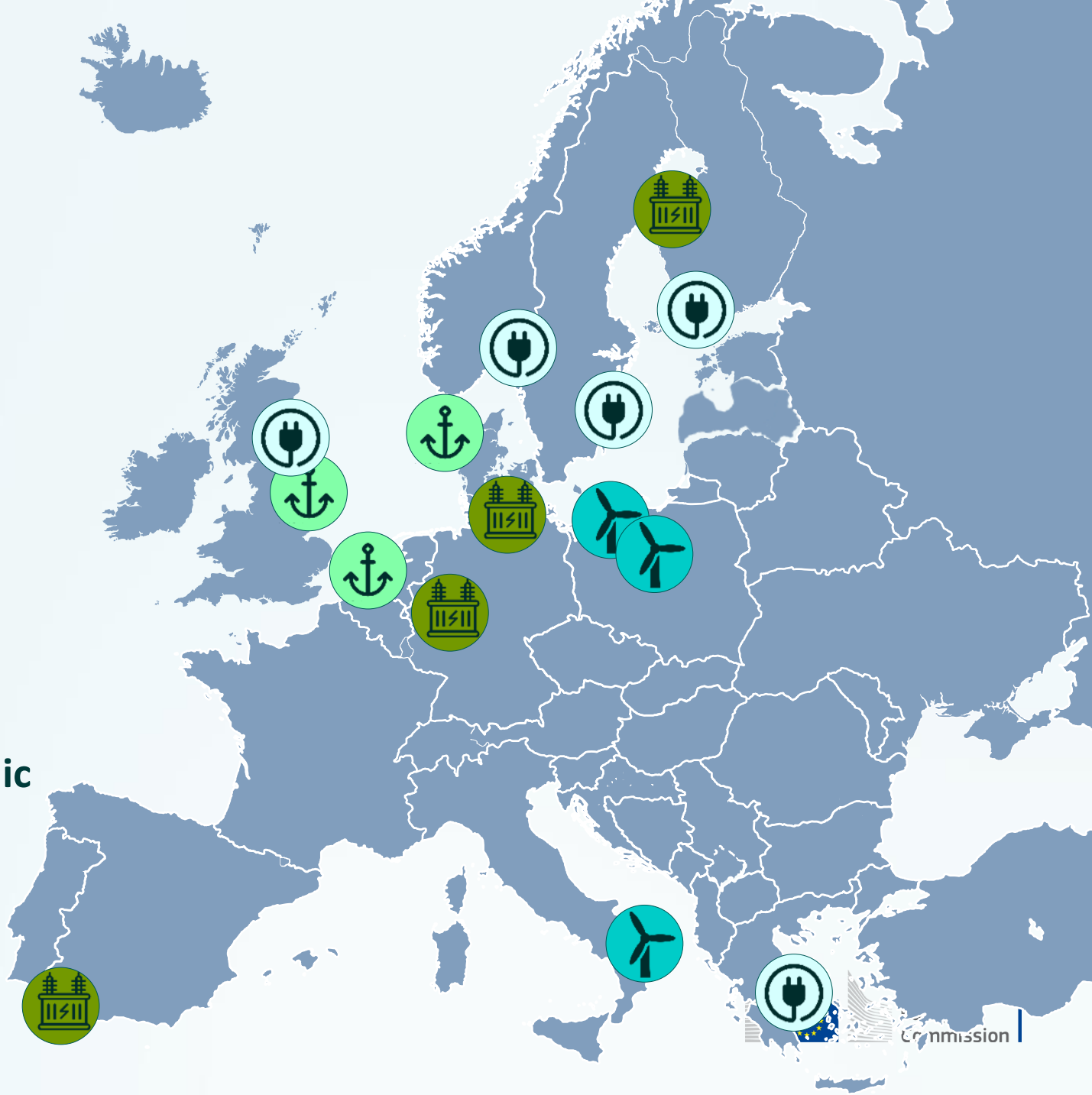
Recent European wind supply chain investments

New component factories
Hubs, nacelles and blades

Offshore turbine foundation factories
In Rotterdam, Teesside and Esbjerg

Grid technology factories
In Bad Honnef, Vaasa, Rostock, Cadiz

Prysmian, Nexans, NKT, JDR and Hellenic
All expanding existing factories



Example: Gearbox drivetrains

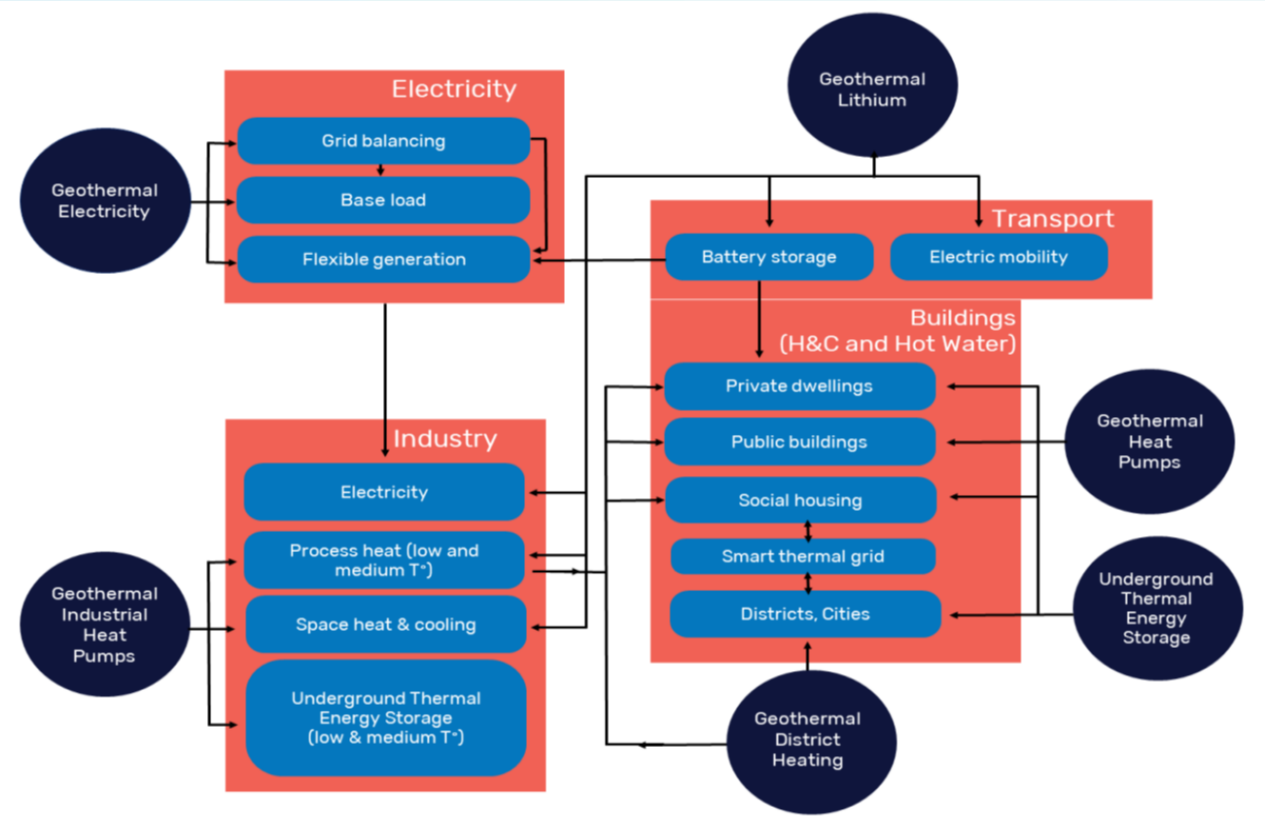
Type of support required	**CAPEX** support to upscale manufacturing facilities to produce larger drivetrains from 15 MW up to 25 MW.
Size, amount of financial support required	**40-50 m€.**
GHG emission avoidance and cost efficiency	• Manufacturing 35 GW wind power products during first 10 years of operation • Absolute GHG emission avoidance of 6.67 mtCO2eq during the first 10 years of operation • Cost Efficiency = 40-50 m€ / 6,67 mtCO2e = **6-7 €/tCO2eq avoidance**
Beyond the state of art	• Buildings with up to 500t lifting capacity in comparison to the 230t of the 15+ MW powertrains • Largest test bench of 35 MW max power for serial production and product validation (prototypes) • New production site with direct water access to handle the transport of 15+ MW powertrains • Geared powertrains for offshore wind can reduce critical raw materials needs compared to current state of art direct-drive powertrains (neodymium, dysprosium by -87.5%, and copper by -90%)
If no invest	EU gearbox and drivetrain manufacturers (two) will not be able to meet demand for the new generation of innovative gearboxes and powertrains of 15 MW and more. This will lead to increased demand for imports from non-EU solution providers and limit the supply chain resilience of the European wind industry.

Innovation Fund – Stakeholder insights

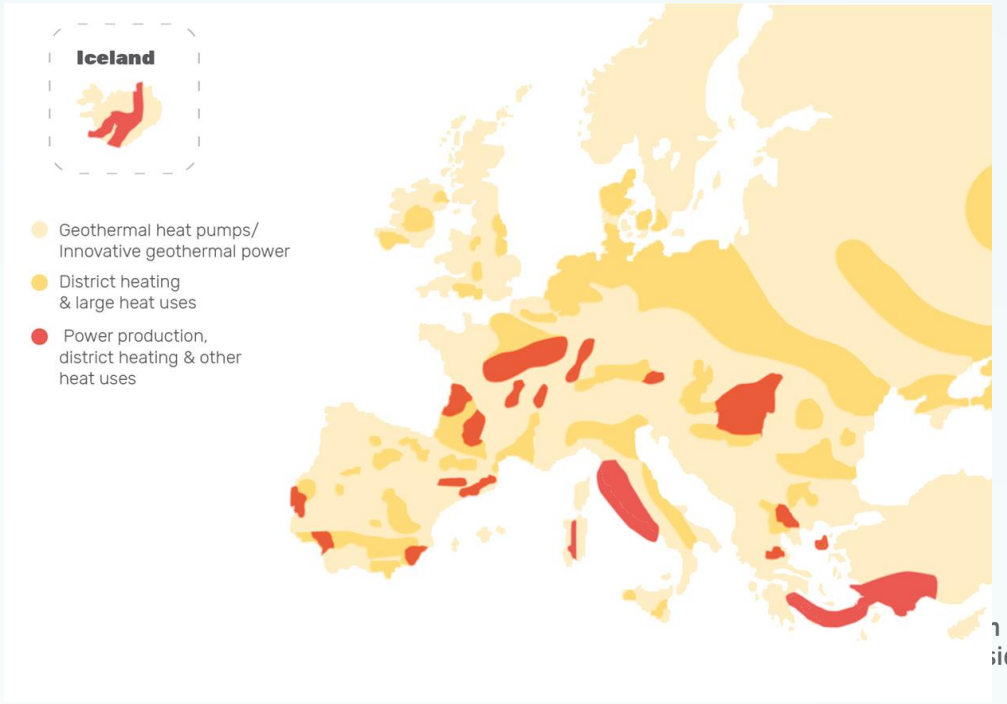
European Geothermal Energy Council (EGEC)
Geothermal sector

European Commission

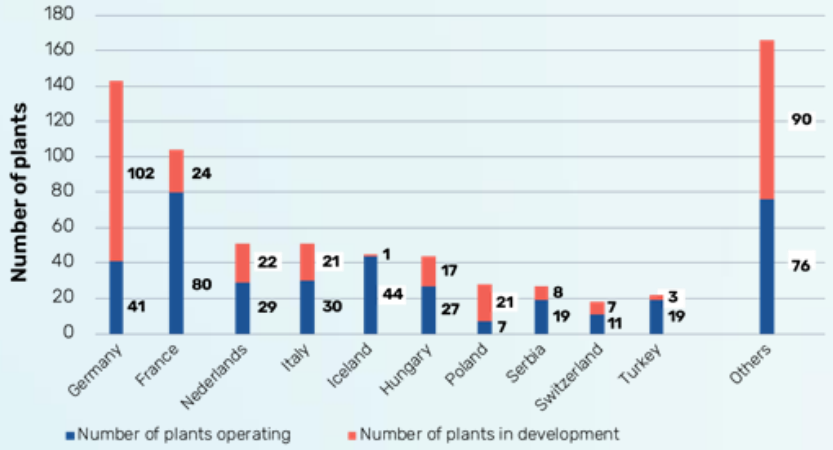
Overview of the sector and innovative technologies

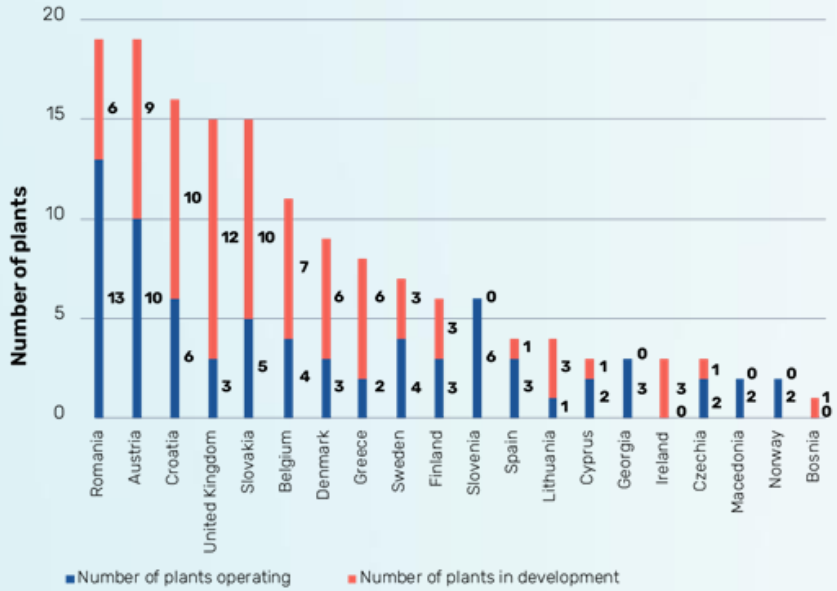


- **142 Geothermal electricity plants**: 3,5 GWe installed and more than 22 TWh produced
- **395 geothermal DH systems in operation**, with 14 new in 2022: 5,6 GWth capacity
- **More than 2,19 million geothermal heat pumps** in Europe at the end of 2022.



Planned pipeline of innovative projects





- **316 new projects** under active investigation, which add over 744 MW to the operational 5,608 MW capacity.
- More than **300 are being developed** or are under investigation.

- **Capital intensive and de-risking projects**
- **Financing demonstration projects must be going beyond the “one-size-fits-all approach”**
- **Financing mechanisms to best deliver financing to innovative projects with a high technology risk, and a likely long term pay back perspective**

European Commission

Conclusions and recommendations

- Ensuring balanced coverage of renewable energy technologies, as 69% of project proposals were in the energy intensive industries category and dominated by hydrogen.
- Specific consideration must be given to innovative energy solutions that accelerate smart sector integration such as renewable heating, cooling and power applications in buildings and industry.
- Need to be able to clearly include the many benefits a geothermal project can be providing towards decarbonising the energy system beyond direct GHG emission reduction
- Need for a dedicated category for renewable heating, cooling, electricity and lithium extraction in the Innovation Fund.
- Funding policy decisions: national exploration campaign for CRMA, binding RHC from RED III (e.g. a de-risking insurance scheme)

Planned pipeline of innovative projects

Scheme/Project	*Technology type*	*Entry into operation*	*EU / MS support schemes*	*Member State*
ENERCAP	Electromagnetic - SC	2023	Horizon Europe	Poland, Spain, Germany, Estonia, France
GREENCAP	Electromagnetic - SC	2023	Horizon Europe	France, Germany, Estonia, Ireland, Netherlands, Italy
HEDAsupercap	Electromagnetic - SC	2023	Horizon Europe	Portugal, Sweden, Italy, Belgium
PHyS-2D-GraM	Electromagnetic - SC	2023	Horizon Europe	Ireland
THERMOBAT	Thermal - LHS	2022	Horizon Europe	Spain, Netherlands, Sweden
HERCULES	Thermal - SHS	2022	Horizon Europe	Netherlands, Denmark, Germany, Greece, Spain, Sweden
SCO2OP-TES	Thermal - SHS	2023	Horizon Europe	Italy, Sweden, France, Portugal, Czech Republic, Greece, Spain

What can we see from this table?

1. **Energy storage projects,** despite their impact on reducing GHG emissions, are underrepresented funding mechanisms, including from the Innovation Hub.

2. **Energy storage deployment – and innovative projects – varies widely;** some countries attract many projects, while others have none.

3. **Novel technologies (i.e. LDES),** face the greatest funding challenges.

Case studies

Sector	Technology	Project/Location	Country
Steel recycling	Thermal Energy Storage	CIC EnergiGUNE	Spain
Electricity markets	Pump Hydro	Mooserboden Dam	Austria
	Chemical - P2G	Hybridge	Germany
District heating	Thermal Energy Storage – Sensible Heat	Aalborg	Denmark
	Power to Hydrogen	Puertollano Green Hydrogen Plant	Spain

1. **Energy storage technologies provide a wide array of services:** not only for the electricity grid, but also for industries, for the gas sector – ensuring energy sector integration.

2. **Energy storage technologies can be coupled with renewables** – yet this is still under appreciated.

Conclusions and recommendations

Recommendations for the Innovation Fund

1. **Broaden focus and adjust evaluation criteria to account for the long-term GHG reduction impact of RES** to balance support between storage projects and low-carbon technologies and prioritise climate targets and energy security.

2. **Introduce technology-specific calls** or allocate **funds exclusively for energy storage technologies.**

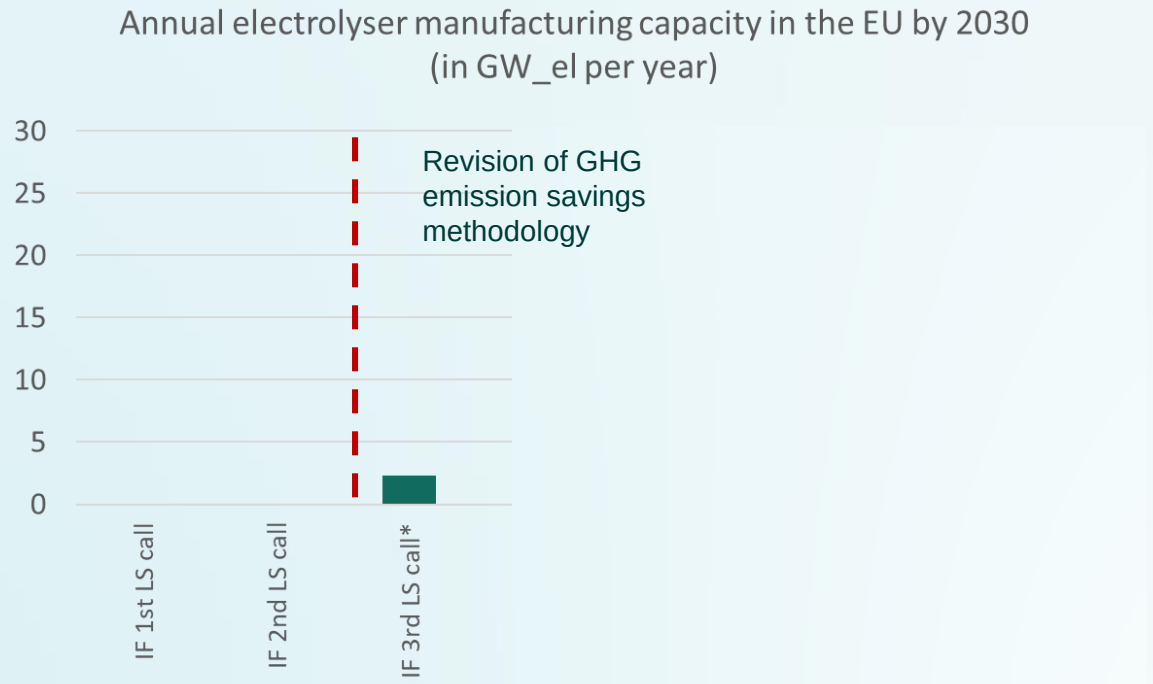
3. **Increase visibility and support for energy storage and combined renewable energy projects** (e.g., wind or PV coupled with storage) for their innovation and their role in energy shifting with renewable integration and GHG reduction contributions.

Innovation Fund – Stakeholder insights

Hydrogen Europe
Hydrogen Energy

European Commission

Innovation Fund's impact on Electrolyser manufacturing

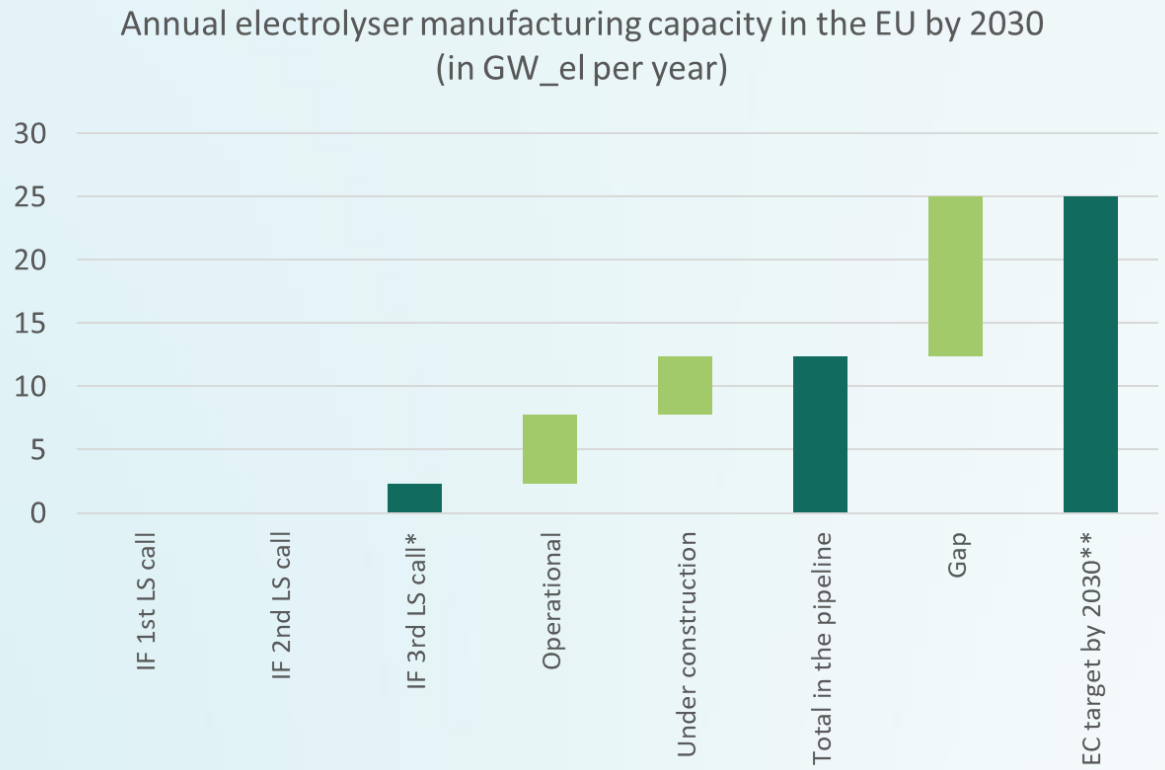


- **Improvement of the GHG savings calculation methodology led to successful electrolyser manufacturing projects.**

- The revision of the GHG emission saving methodology has led to some electrolyser manufacturing projects being able to secure grants.

* The manufacturing capacity estimated based on claimed emission savings as some projects do not disclose precise information about annual manufacturing capacity

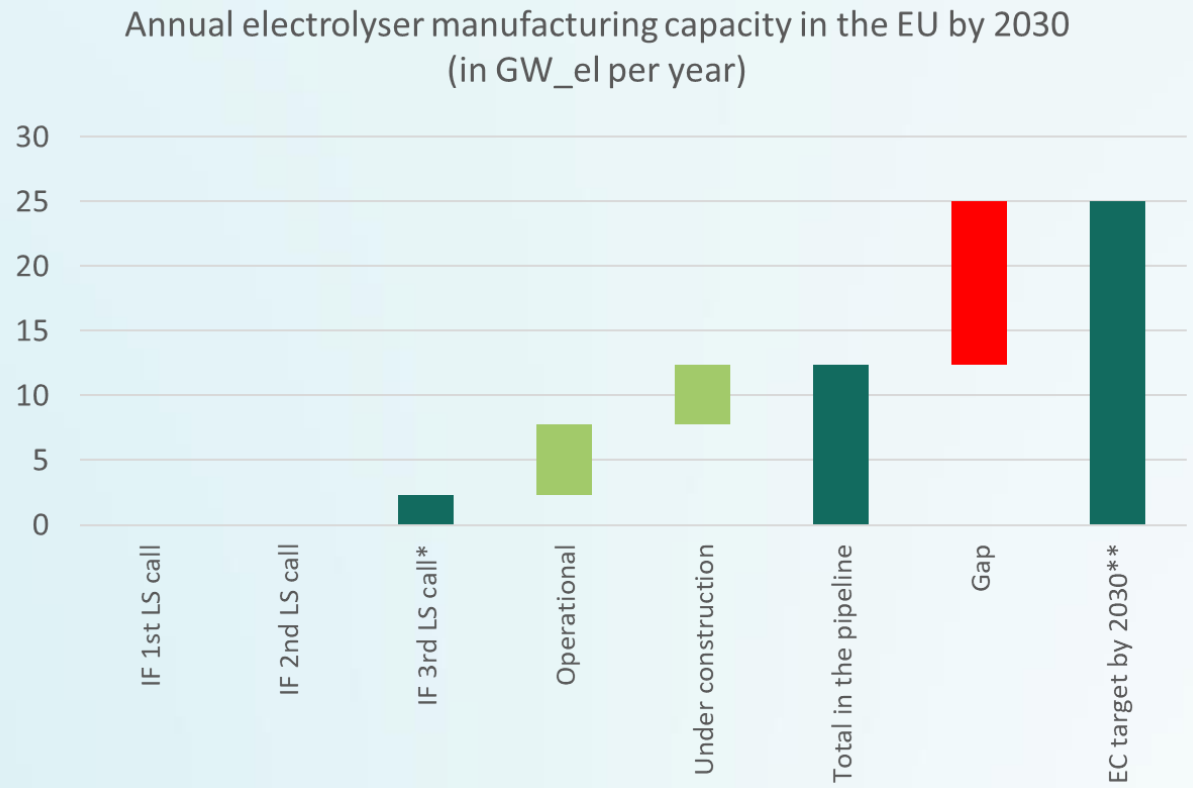
Innovation Fund's impact on Electrolyser manufacturing



- The contribution of the Innovation Fund towards the overall electrolyser capacity buildup has already been noticeable.
- Potentially more to be added after the results of the 4th call are announced.

* The manufacturing capacity estimated based on claimed emission savings as some projects do not disclose precise information about annual manufacturing capacity

Innovation Fund's impact on Electrolyser manufacturing



- **The gap vs targets remains sizeable.**
- Fuel cells manufacturing, which are also mentioned as strategic technologies under ENZA have so far failed to secure any funding.

European Commission

* - The manufacturing capacity estimated based on claimed emission savings as some projects do not disclose precise information about annual manufacturing capacity
** - EU electrolyser manufacturing capacity envisaged by the 2040 GHG targets impact assessment and by the ECHA's Electrolyser Partnership

Innovation Fund – Stakeholder insights

European Heat Pump Association (EHPA)
Heat Pump Sector

European Commission

Overview of the sector and innovative technologies

Main bottlenecks for these new technologies to reach pre-commercial status

- Innovations all along the value chain of manufacturing, combined with economies of scale that reduces price;
- Extensive use of digital design and modelling in the manufacturing process (for all components and as a whole), coupled with experimental testing;
- Cooperation of several partners/companies in the complete value chain of a heat pump (e.g., RD&I), coupled with adequate support;
- Lack of experience in terms of system design, sizing and operation, leading to high investment risk for large HPs;
- Consistent policies that allow the sector to plan ahead (e.g., investments)

Planned pipeline of innovative projects

- EIC or Horizon Europe may be helpful, however, the funding is difficult to obtain.
- Far more suitable would be grants or to contribute towards the pre-finance development costs. These being aimed at developing, testing, and validating the concepts. The results can actively contribute in the discussion with policy experts to ensure technical and economical feasibility are aligned with political goals. (examples such as Ademe, ANR from the Britany region of France).
- Most of the projects we see needed require a **maximum of 10 mil. EUR**. With more ambitious ones passing 50 mil. EUR, CAPEX and OPEX also depends on the project type and scale and our industry members can elaborate if needed.

Case studies

MagnaTherm: magnetocaloric products for retail chillers. Exergyn built a pre-commercial heat pump funded by an OEM and DTIF grant in Ireland.

BASE innovations did a small ASHP integrated PVT trial on a building

Innovative Thermorefrigerating heat pump operating with propane based on Pole Cristal R&I development

LSC2022: chemical sector proposed a project using industrial heat pumps (> 10 MWth) to produce high temperature/steam heat (up to 200°C) based on tested technology up to 120°C (LIFE HeatLeap project closed)

Conclusions and recommendations

- Focus on transition and industrial policy, maintaining / reshoring the heat pump industry
- Bring hard-to-abate companies, cities and social housing companies on board
- Focus on manufacturing but also at the value chain for added efficiencies
- Consistent policies that translate into concrete short to medium term funding (e.g., Heat Pump Action Plan)
- Focus on the entire system rather than component improvements, with consideration of ability to directly serve short term needs (such as climate friendly residential environments and industrial processes). Make this system modular

Innovation Fund – Stakeholder insights

Turboden SpA
Manufacturer (ORC Turbine, Industrial Heat Pumps)

European Commission

Overview of the sector and innovative technologies

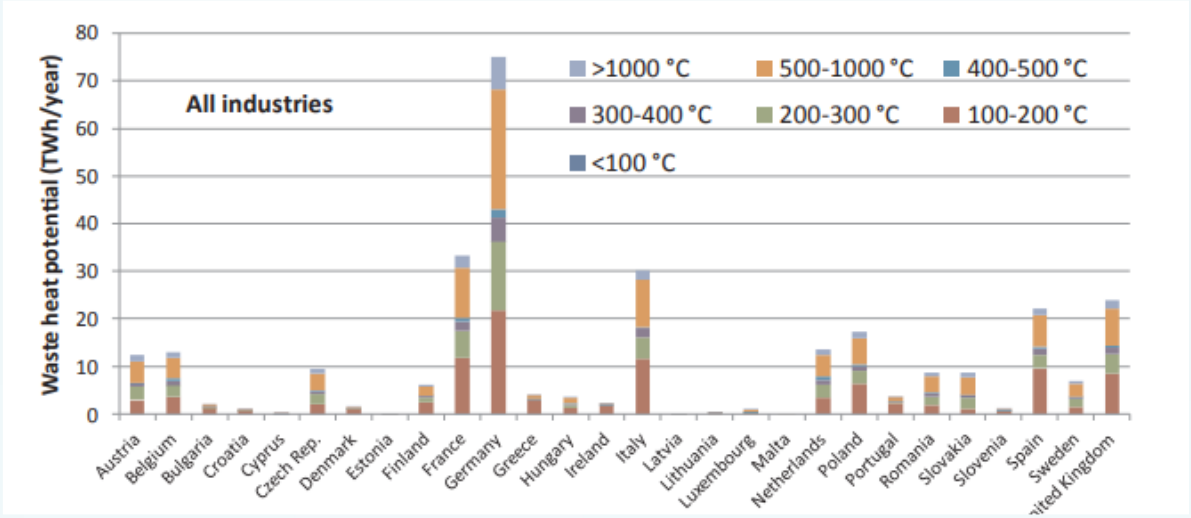
WASTE HEAT RECOVERY TO POWER

ORC technology

Europe has significant potential for **excess heat recovery** from power production, industry and commercial premises. **Industrial plants of energy intensive industries** such **as cement, glass, petrochemical, non-ferrous metals and steelmaking**, **dissipate between 30% and 60% of the overall energy consumed** as waste heat into the atmosphere.

Technical potential for waste heat recovery from Europe's key industries by temperature level is estimated at **around 300 TWh/year** (equivalent to 26 Mtoe)1.

At least **150 TWh/year of electricity could be generated by harvesting currently untapped thermal energy by ORC – organic Rankine cycle technology** (equivalent to the power consumed by 20 million citizens, the annual production of 19 nuclear power plants or the annual consumption of the Netherlands and Denmark combined2,3)



Waste heat potential in each EU country by temperature level and country (Source: Papapetrou et al, 2018)

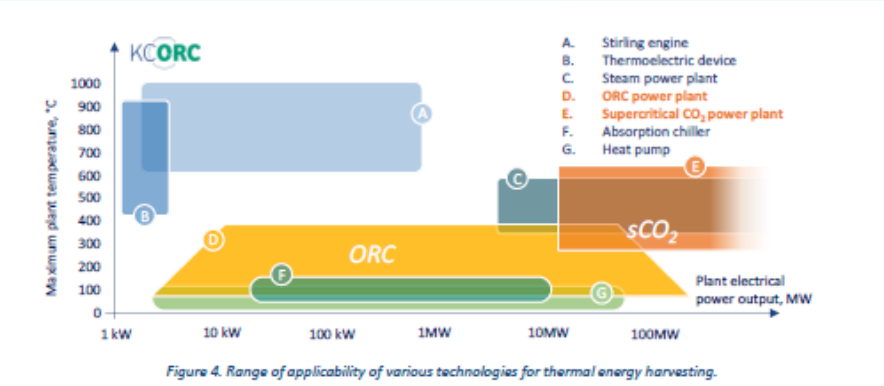


Figure 4. Range of applicability of various technologies for thermal energy harvesting.

Source:
1. Papapetrou, et al. (2018). Industrial waste heat: Estimation of the technically available resource in the EU per industrial sector, temperature level and country. Applied Thermal Engineering. 138. 10.1016/j.applthermaleng.2018.04.043.
2: Thermal Energy Harvesting Advocacy Group (TEHAG), 2022. Thermal Energy Harvesting - the Path to Tapping into a Large CO2-free European Power Source
3. HEATLEAP PROJECT (2023): "Waste Heat Recovery Potentials, applications and recommendations for better policies - https://heatleap-project.eu/

European Commission

Overview of the sector and innovative technologies

Types of innovation, beyond commercial state-of-the-art technologies with replication capacity that could benefit from support

- **ORC (organic Rankine cycle)** technology for **waste heat to power, multi-feed technology suitable also for geothermal**
- **Recognise all sources and applications** adopting policy measures giving visibility to the entire range of waste heat recovery solutions from hard to abate sectors

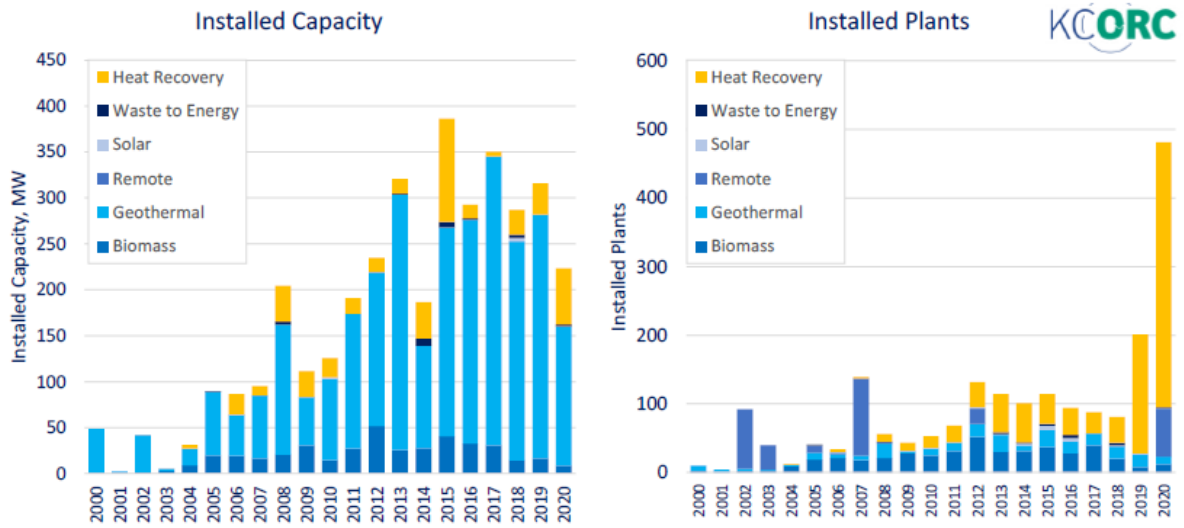


Figure 5. (left) Installed ORC power plants capacity and (right) number of installed ORC power plants over the years, indicating also the thermal energy source (biomass combustion, geothermal reservoirs, waste thermal energy, solar radiation) [62]

National support schemes:

- **Italy -** White Certificates Scheme
- **France -** Certificat d'Economie d'Energie or CEE
- **Germany –** partially in CHP regulation
- **Sweden** - Elcertificate market

Size and amount of financial support required

- **Financial support from Innovation Fund: suggested in the range of 30% of CAPEX for single project**
- **Range of CAPEX for single waste heat to power project: between 2M€ - 30M€, depending mainly on 3 factors:**
  - Size of the plant
  - Type of industrial process (level of complexity) steel, glass, cement, refinery, …
  - Type of technologies adopted
- **Opex are generally low and depend on maintenance costs**

Conclusions and recommendations

- **ORC (organic Rankine cycle) technology:**
  - Multi-feed application in geothermal, biomass, waste heat to power
  - EU excellence
  - Quite penetration despite the huge potential
  - Growing niche also outside EU, needs of more attention

Q&A Section

European Commission

Discussion Section

Jakob Wachsmuth, Fraunhofer ISI, Senior Researcher

European Commission

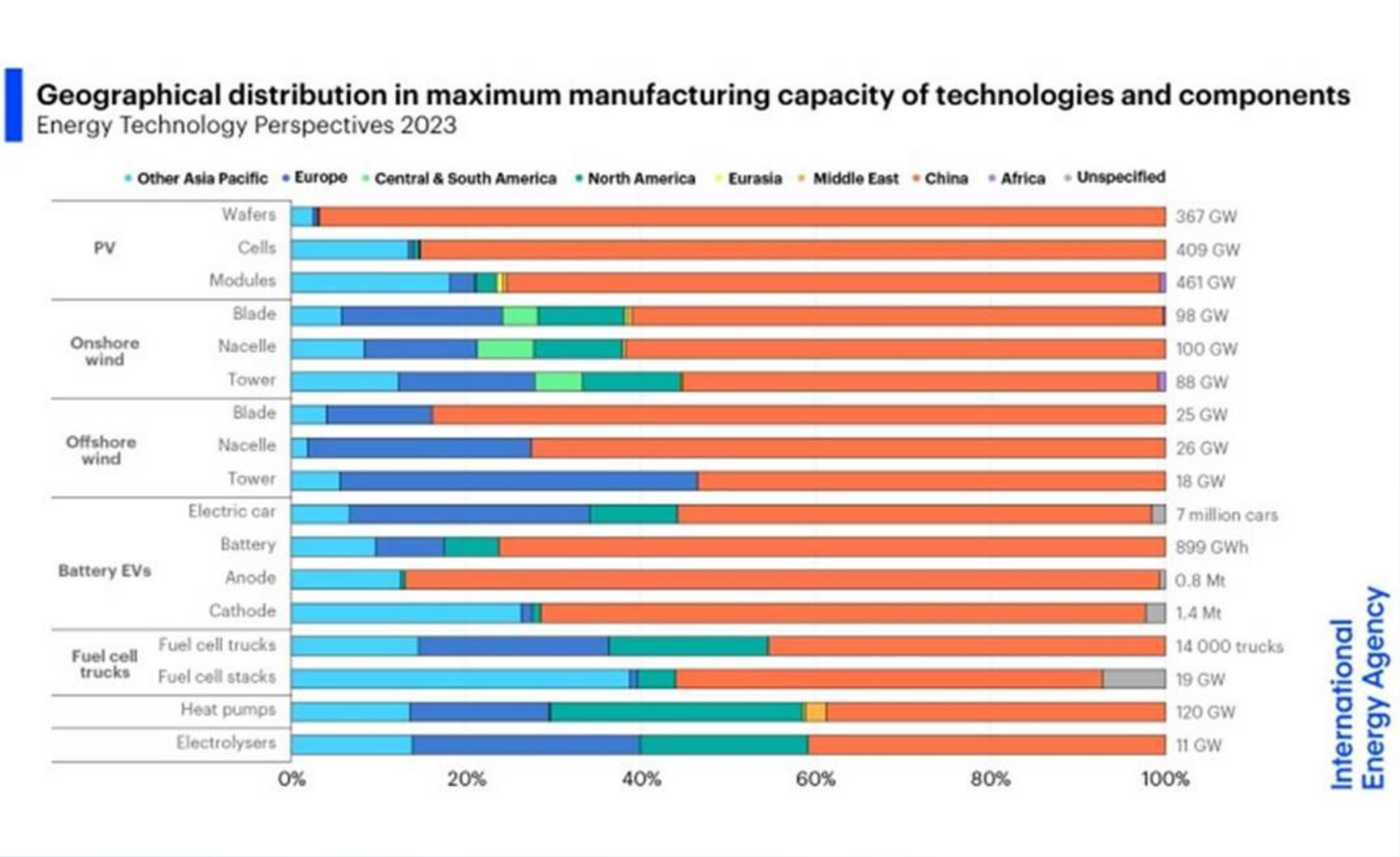
We want to hear your views and your experience

1. What criteria would be most relevant for assessing the resilience of EU value chains, specifically in terms of ensuring a secure and sustainable supply of net-zero technologies and enhancing competitiveness within Europe?

2. Having in mind the sustainability of the manufacturing process and the trade-off between accuracy of results and complexity of the process, should upstream emissions (extraction, production, and distribution of raw materials) be included for Manufacturing, RES and ES projects?

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?

What criteria would be most relevant for assessing the resilience of EU value chains?



NZIA, Art. 20, 1a (a):
"[…] contribution to resilience, taking into account the proportion of the net-zero technologies or its main specific components that originate from a third country accounting for more than 50% of the supply of that specific net-zero technology or its main specific components within the Union; […]"

Source: IEA 2023 Energy Technology Perspectives Energy Technology Perspectives 2023 – Analysis - IEA

European Commission

Contribution to Europe's industrial leadership, competitiveness and resilience

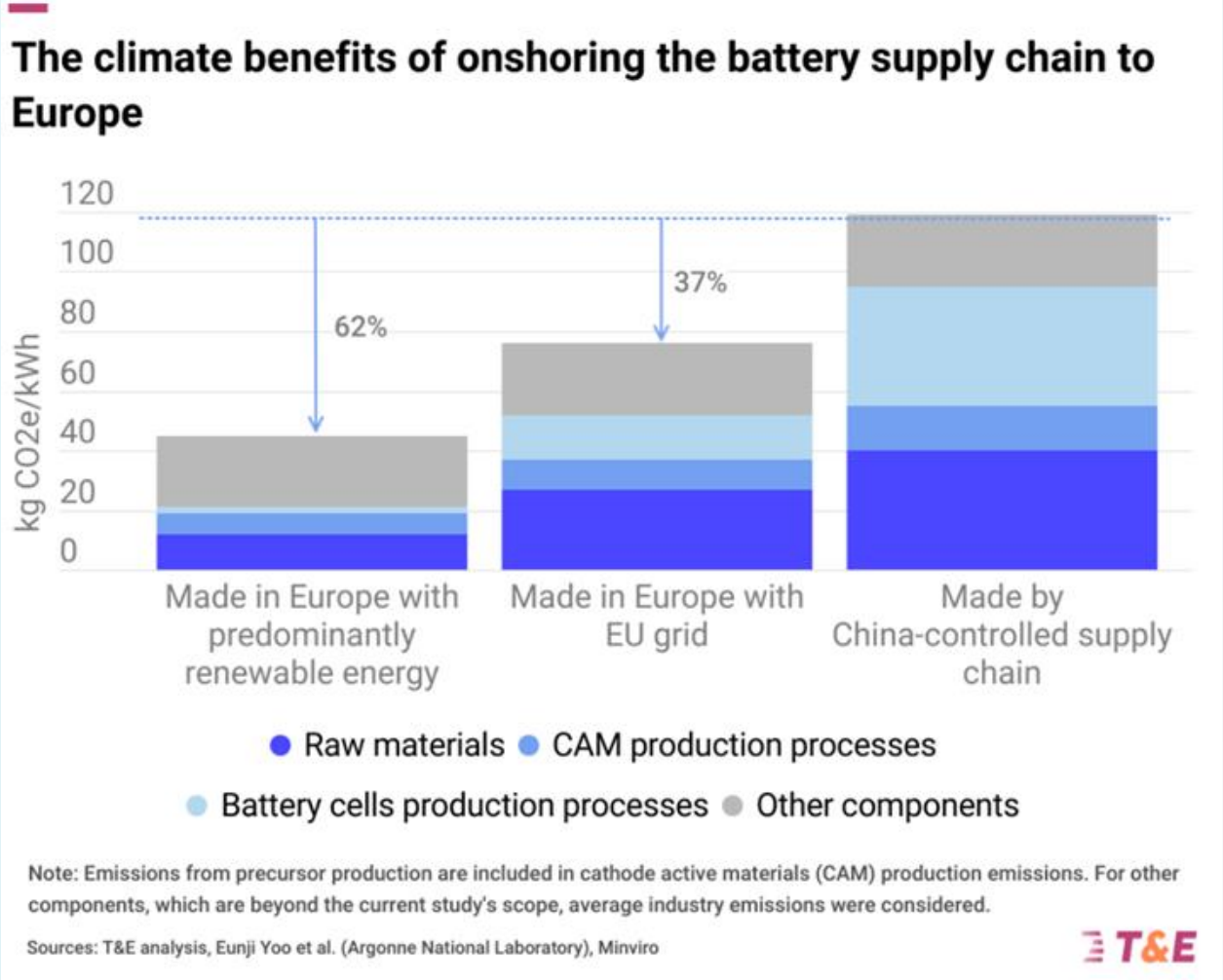
- **Alternative to NZIA:** Contribution to Europe's industrial leadership, competitiveness and resilience
- **Standard approach** under other EU funding programmes:

  Call objectives: (amongst others) to support creation of European value chains and European industrial leadership and competitiveness in the clean tech sector.

  Award criterion: *Projects should demonstrate that they support EEA value chains and its resilience in terms of*

  - *location of their supply chains,*
  - *development of new technology,*
  - *creating new IP rights,*
  - *recycling strategy helping to reduce dependency on critical raw materials,*
  - *other positive spillover effects: contribution to create new industrial ecosystems (e.g. clusters), jobs created, trainings or other actions.*

Should upstream emissions (extraction, production, and distribution of raw materials) be included for Manufacturing, RES and ES projects?



What to include?

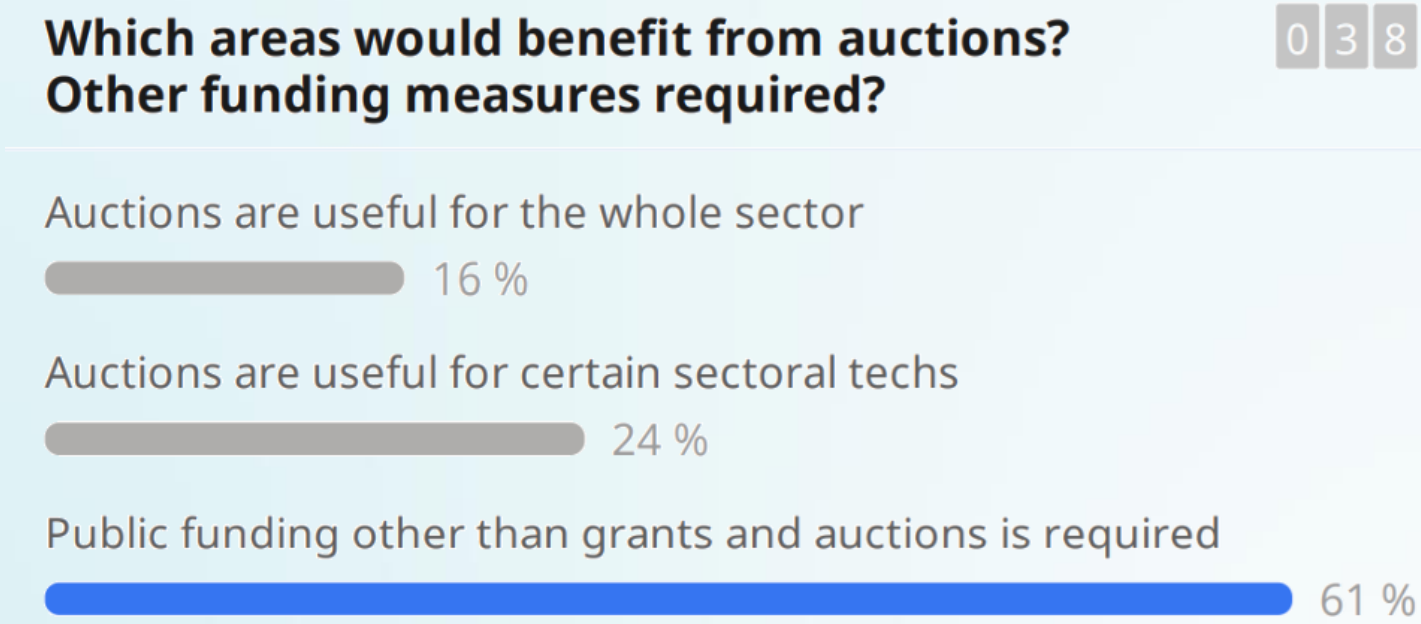
- Scope 1 (Direct emissions)
- Scope 2 emissions (indirect emissions of energy input)
- Scope 3 emissions (indirect of value chain)
  - Upstream
  - End-of-life

European Commission

T&E, 2024, Fig. 25: https://te-cdn.ams3.digitaloceanspaces.com/files/An-industrial-blueprint-for-batteries-in-Europe-How-Europe-can-successfully-build-a-sustainable-battery-value-chain.pdf

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…



European Commission

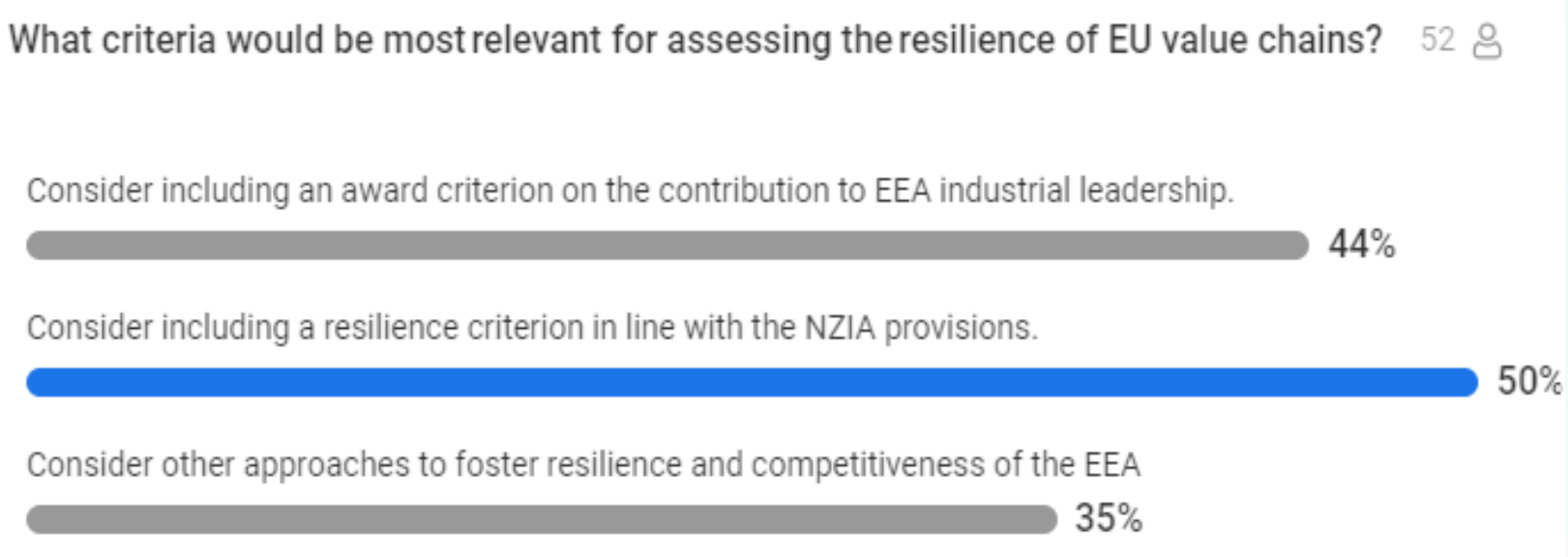
Slido Poll

1. What metrics would be most relevant for assessing the resilience of EU value chains?
2. Should GHG emissions along the whole value chain be considered?
3. What kind of projects are you planning?

European Commission

Slido Poll Results

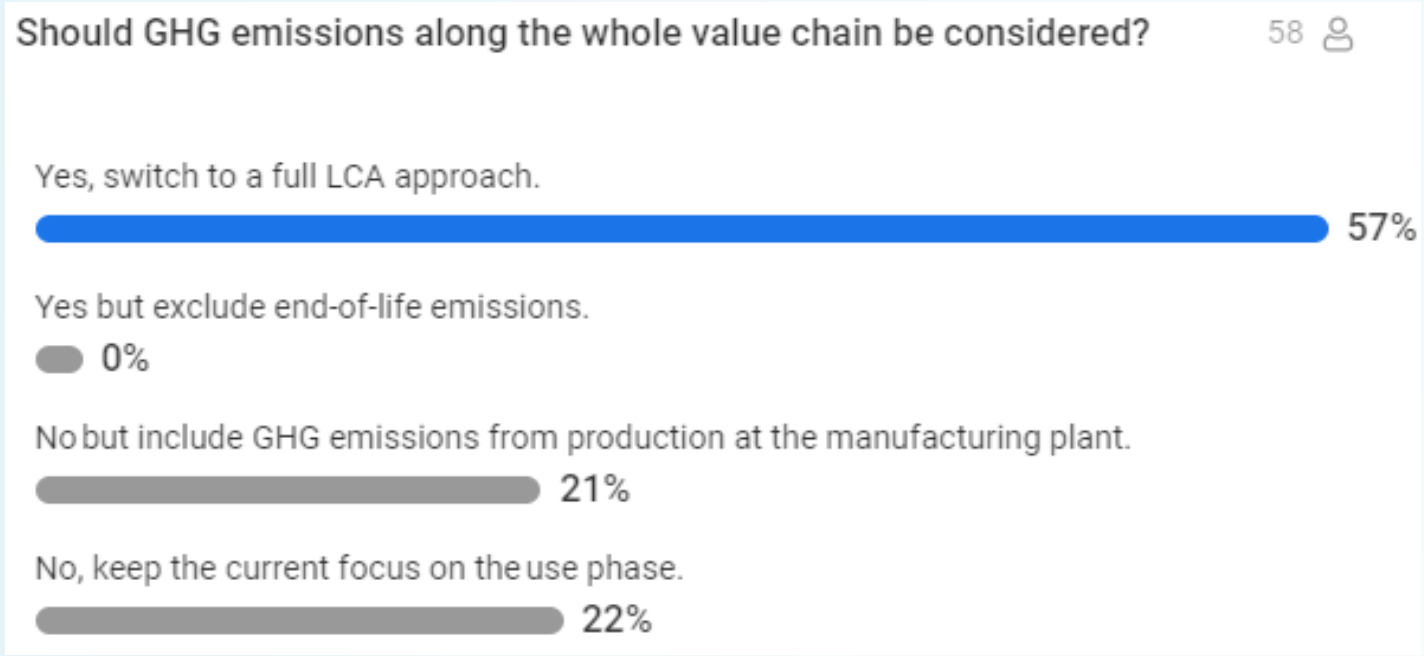
1 What criteria would be most relevant for assessing the resilience of EU value chains?



European Commission

Slido Poll Results

2 Should GHG emissions along the whole value chain be considered?

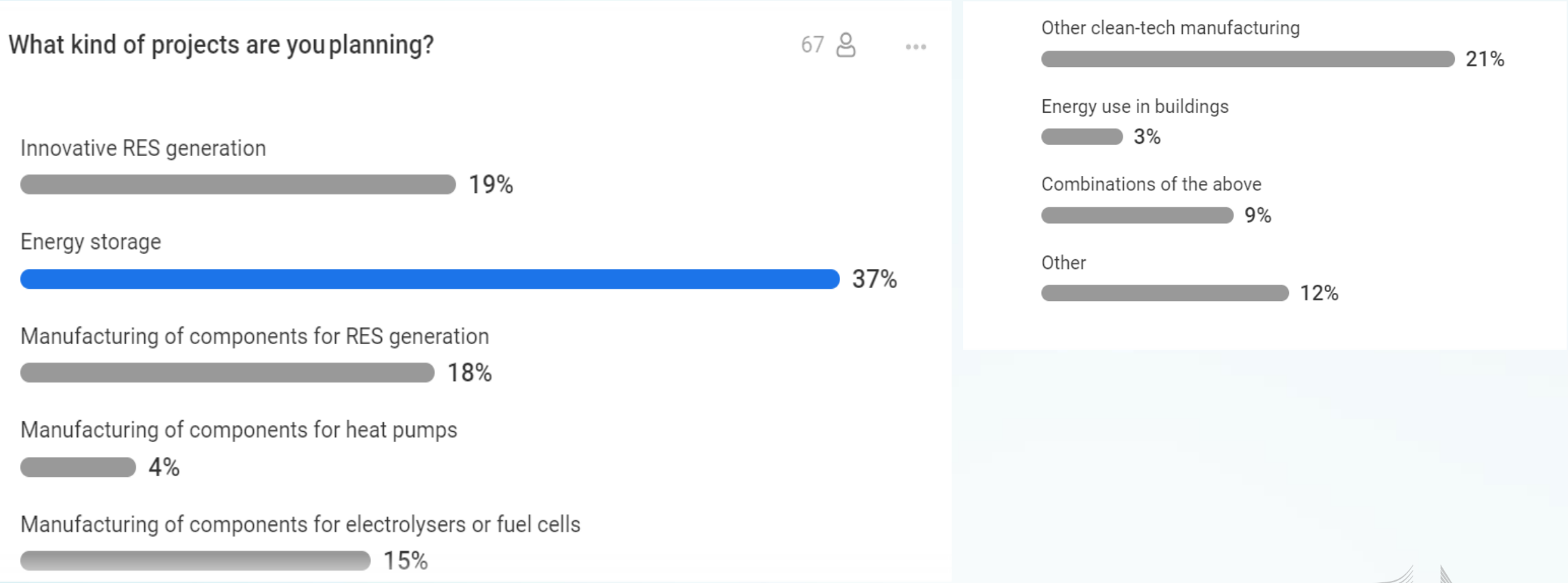


European Commission

Slido Poll Results

3

What kind of projects are you planning?



European Commission