ETIP Wind

EUROPEAN TECHNOLOGY & INNOVATION PLATFORM ON **WIND ENERGY**

Advisory Group meeting

November 2019

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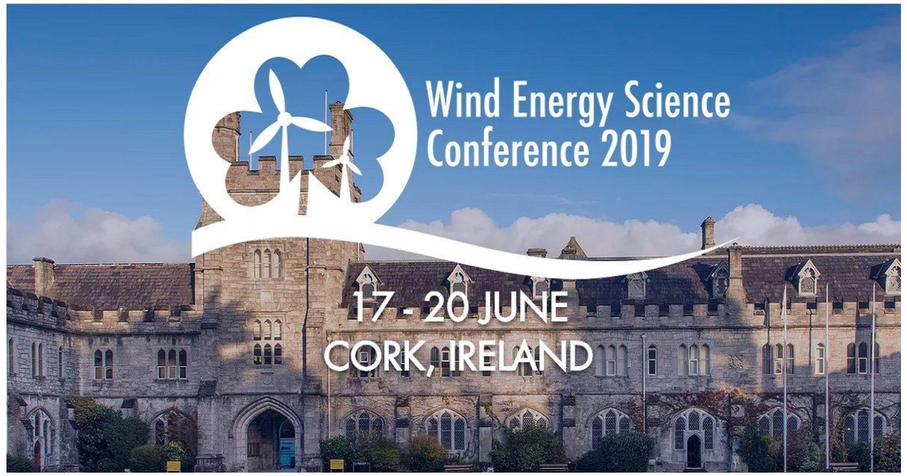
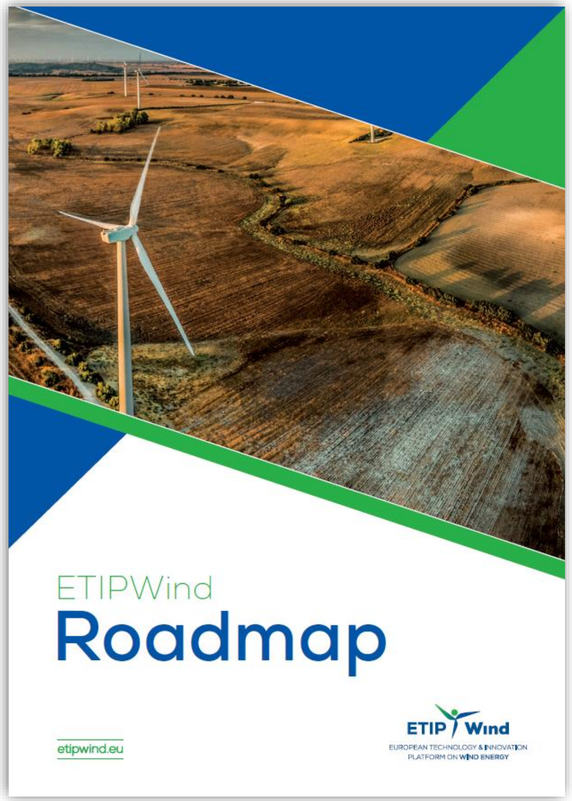
Alexander Vandenberghe

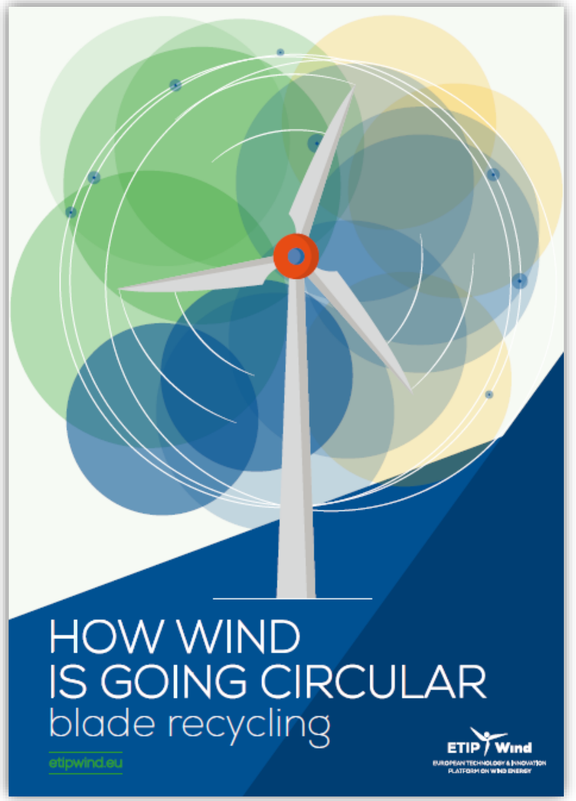
ETIPWind secretariat

MEETING AGENDA	
TIME	**AGENDA ITEM**
14:30 – 14:40 (10 min)	**Welcome** Mike Anderson, meeting chair Aidan Cronin, Executive Committee chair
14:40 – 15:00 (20 min)	**Updates from the secretariat** • Technology roadmap (10′) • Factsheet on composite material recycling (10′)
15:00 – 15:20 (20 min)	**Research & Innovation policies and instruments** • Horizon Europe (10′) • ETS Innovation Fund (10′)
15:20 – 16:30 (1h 10min)	**Advisory Group Vision document** • Introduction by Aidan Cronin (5′) • Roundtable discussion (60′) • Conclusions (5′)
16:30 – 16:40 (10 min)	**Break**
16:40 – 17:00 (20 min)	**Deploying large volumes offshore: identifying supply chain bottlenecks** • Roundtable discussion (20′)
17:00 – 17:20 (20 min)	**Enhancing circularity in the European wind industry (materials and components)** • Roundtable discussion (20′)
17:20 – 17:30 (10 min)	**Survey on corporate R&D spending** • Scope and format
17:30 – 17:40 (10 min)	**AOB**
17:50 – 18:00 (10 min)	**Conclusions and next steps** Mike Anderson, meeting chair
18:00 – 18:30 (30 min)	**End of meeting and registration to WindEurope Members' reception**
18:30 – 21:30	**WindEurope Members' Reception** Industriens Hus, H. C. Andersens Blvd. 18

Update from the Executive Committee







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Visit to Beijing North Power University – How R&I functions in China

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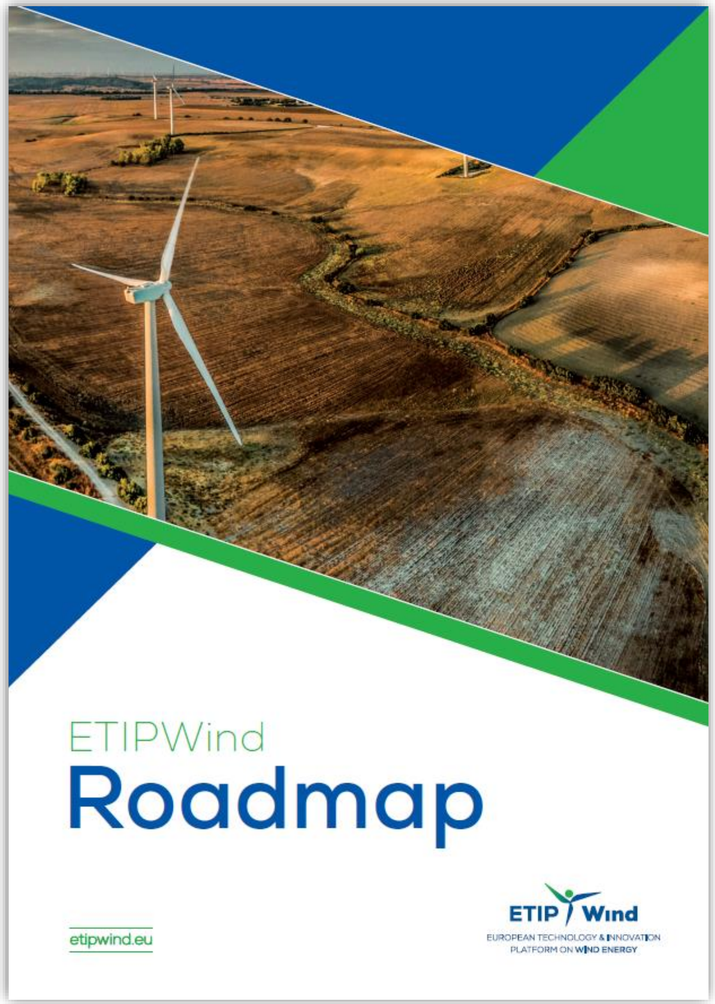
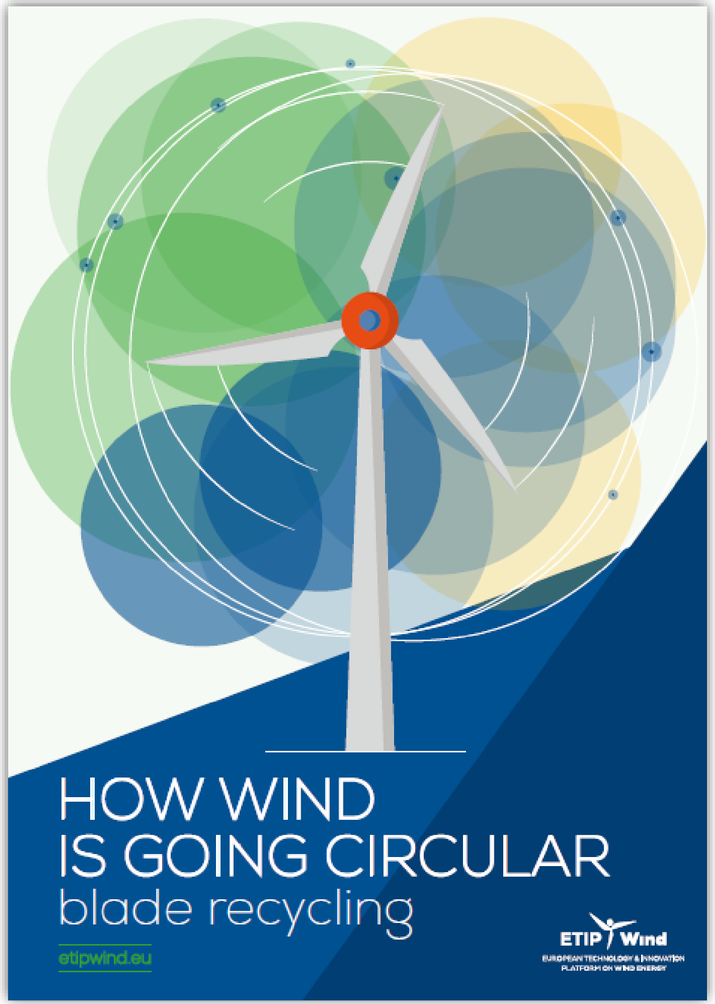
Secretariat updates

ETIPWIND 2019 PUBLICATIONS





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ETIPWind Roadmap

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Why a roadmap?

- Target European Research & Innovation (R&I) policy.
  - Shape the *strategic* approach to R&I funding programmes.
  - Answer the call for specific contributions.

- Define sector-wide challenges and opportunities.
  - Identify specific areas for cross-sectoral collaboration.
  - Monitor progress and evolution in wind energy.

- Align industry and academia.
  - European Academy for Wind Energy (EAWE).
  - EERA joint programme on Wind (EERA JP Wind).

Research & Innovation priorities 2020-2027

Technology Roadmap

- Grid & system integration
- Operations & maintenance
- Next generation technologies
- Offshore balance of plant
- Floating offshore wind
- Skills & human resources

Short-term 2020-2022	Medium-term 2023-2024	Long-term 2025-2027
• Integrated forecasting of power production & demand • Short-term energy storage	• Optimising transmission infrastructure	• Stable system with 100% RES
• Lifetime assesment and condition monitoring • Digital tools for control and monitoring	• Dynamic cable repair solutions • Digital solutions for smart operations • Predicting environmental parameters	
• Development and validation of components & materials • Blade recycling demonstration • Integrating wind energy in the surrounding natural and social environment	• Development of sustainable materials • Standards • Manufacturing processes	• Recycling methods for materials and components
	• Cabling and connections	• Cross-industry agreement and standards • Integrated optimised design plan • Verification of methods and procedures
• Lean production • Validation of design tools • Mooring and anchors • Dynamic electric cables • Control methods		
• Expand and harmonise wind energy teaching in Europe	• Boost wind energy higher education	
• Long-term energy storage	• Quantification of system services • Sustainable hybrid solutions	
• Robotic inspection and repair methods	• Decommissioning strategies and technology • Solutions for operating in extreme conditions	
• New transportation methods for large components	• Sensor technologies, diagnostics and response • Next generation generators • Noise reduction • Reliability of components	• Disruptive technologies
• Data availability & sharing • Serial production – analysis of substructure production processes	• Material durability and protection	
	• Integrated design process in supply chain	• Park level control
	• Joint academia-industry educational programmes	
• Multi-cultured wind farms • Modelling future system needs		
		• Supply chain logistics (decommissioning)
	• Floating installation, assembly and heavy maintenance	

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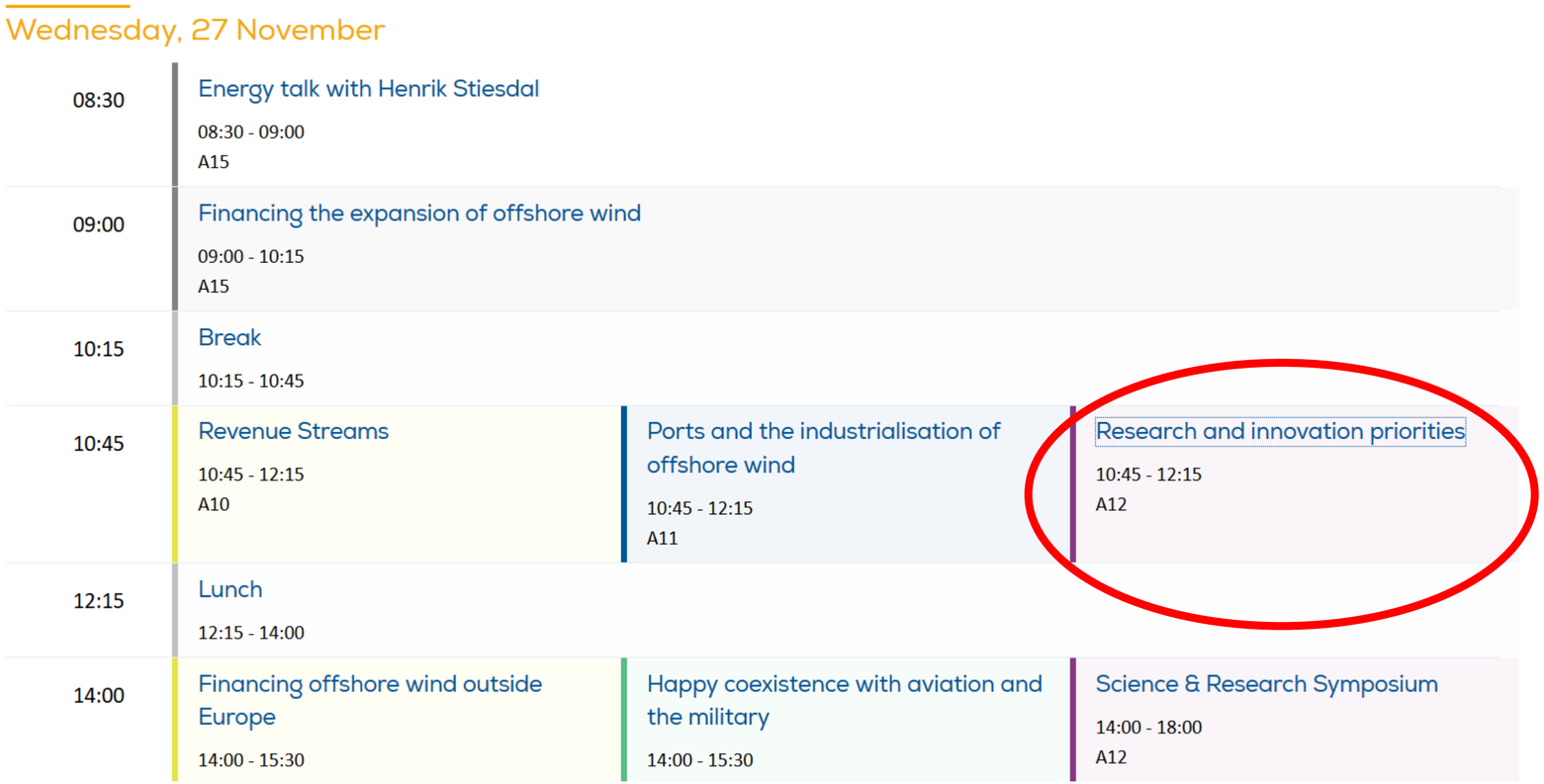
Dissemination to the sector

- Launch @ WindEurope Offshore 2019
- Press release
- Website (interactive)
- Social media posts



Dissemination to European institutions (non-exhaustive list)

CLEAN PLANET
DIRECTORATE D
P. CHILD (act)

- D.1 CLEAN ENERGY TRANSITION
  HoU - **H. CHRAYE**
  DHoU - **J. SCHUPPERS**
- D.2 FUTURE URBAN & MOBILITY SYSTEMS
  HoU - **J.-F. AGUINAGA**
  DHoU - **P. FROISSARD**
- D.3 LOW EMISSION FUTURE INDUSTRIES
  HoU - **H. MARTIN**
  DHoU - **A. GENTILI**
- D.4 EURATOM RESEARCH
  HoU - **E. RIGHI STEELE**
  DHoU - **D. ROSSETTI DI VALDALBERO**

HEALTHY PLANET
DIRECTORATE C
J. BELL

- C.1 CIRCULAR ECONOMY & BIOBASED SYSTEMS
  HoU - **P. MISIGA**
  DHoU - **J. LUCAS**
- C.2 BIOECONOMY & FOOD SYSTEMS
  HoU - **J. BELL** (act)
  DHoU - **...**
- C.3 CLIMATE & PLANETARY BOUNDARIES
  HoU - **P. TULEJ**
  DHoU - **P. TULKENS**
- C.4 HEALTHY OCEANS & SEAS
  HoU - **S. GRUBER**
  DHoU - **J. SUOMINEN**

PROSPERITY
DIRECTORATE F
P. DROELL

- F.1 INDUSTRIAL R&I AGENDAS & BUSINESS INTELLIGENCE
  HoU - **D. SCHRÖCKER**
  DHoU - ...
- F.2 VALORISATION POLICIES & IPR
  HoU - **K. HAAVISTO**
- F.3 SUSTAINABLE INDUSTRY SYSTEMS
  HoU - **J. TIEDJE**
  DHoU - **S. O REAGAIN**
- F.4 MATERIALS FOR TOMORROW
  HoU - **B. VERACHTERT**
  DHoU - **S. BOWADT**

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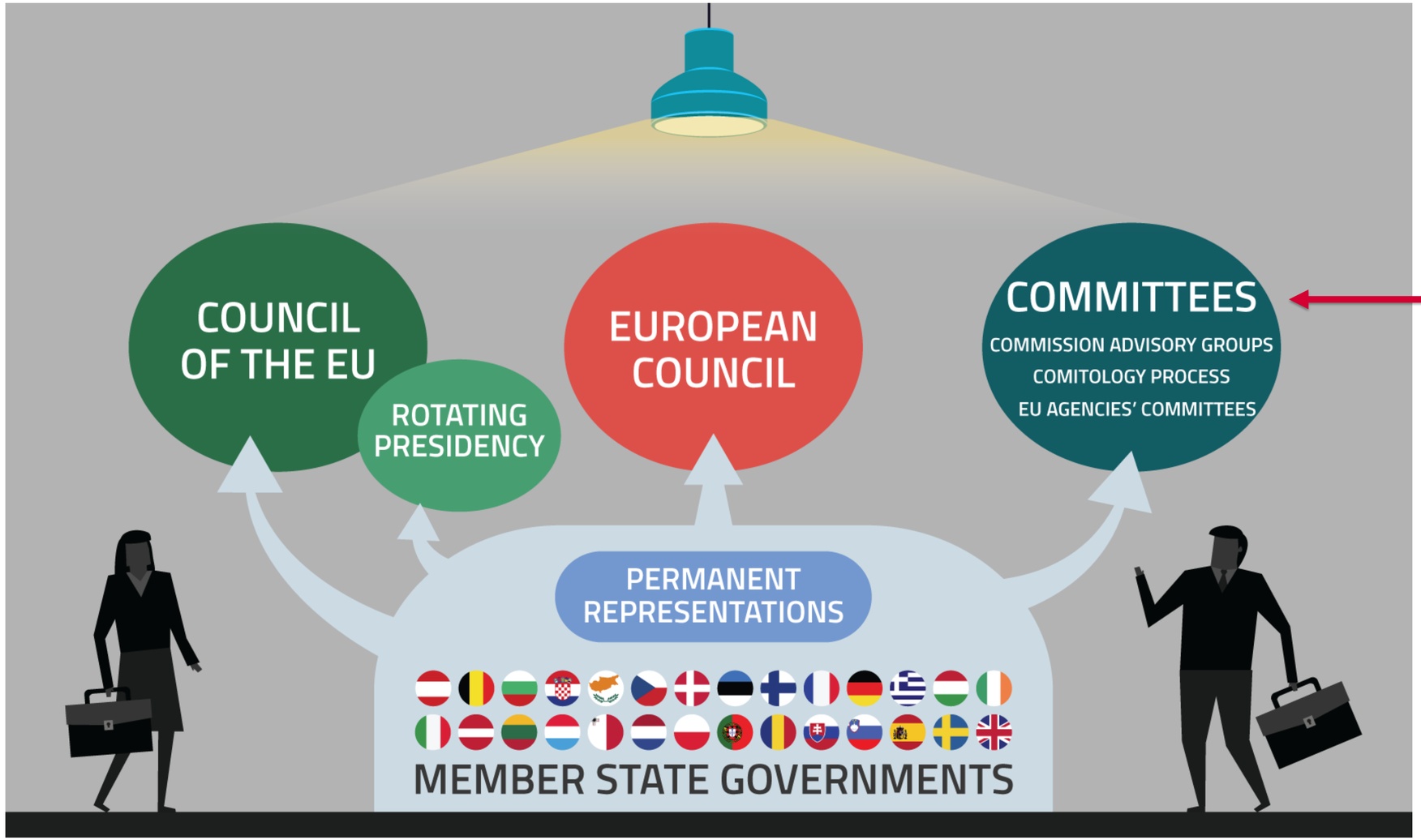
Dissemination to national governments



How wind is going circular

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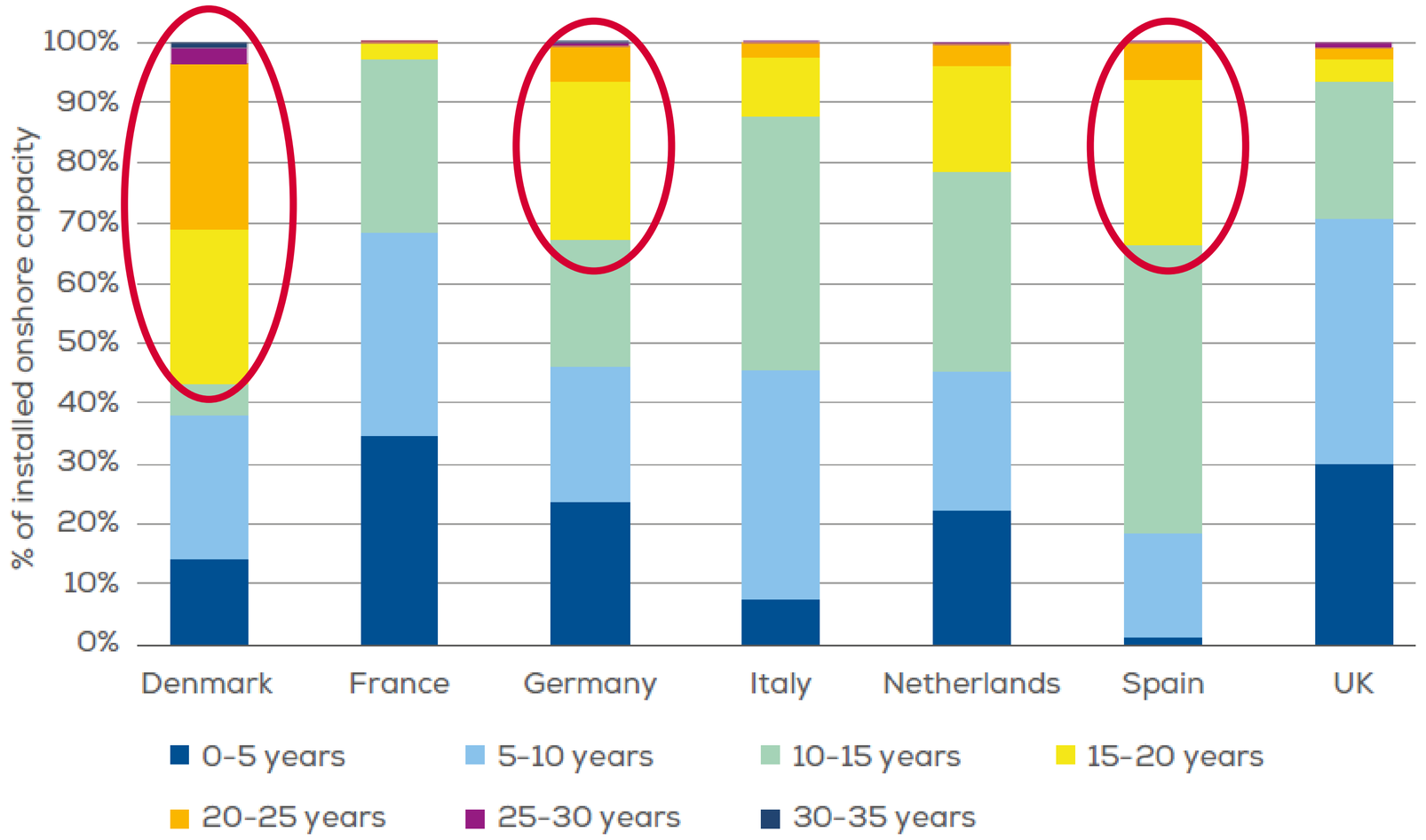
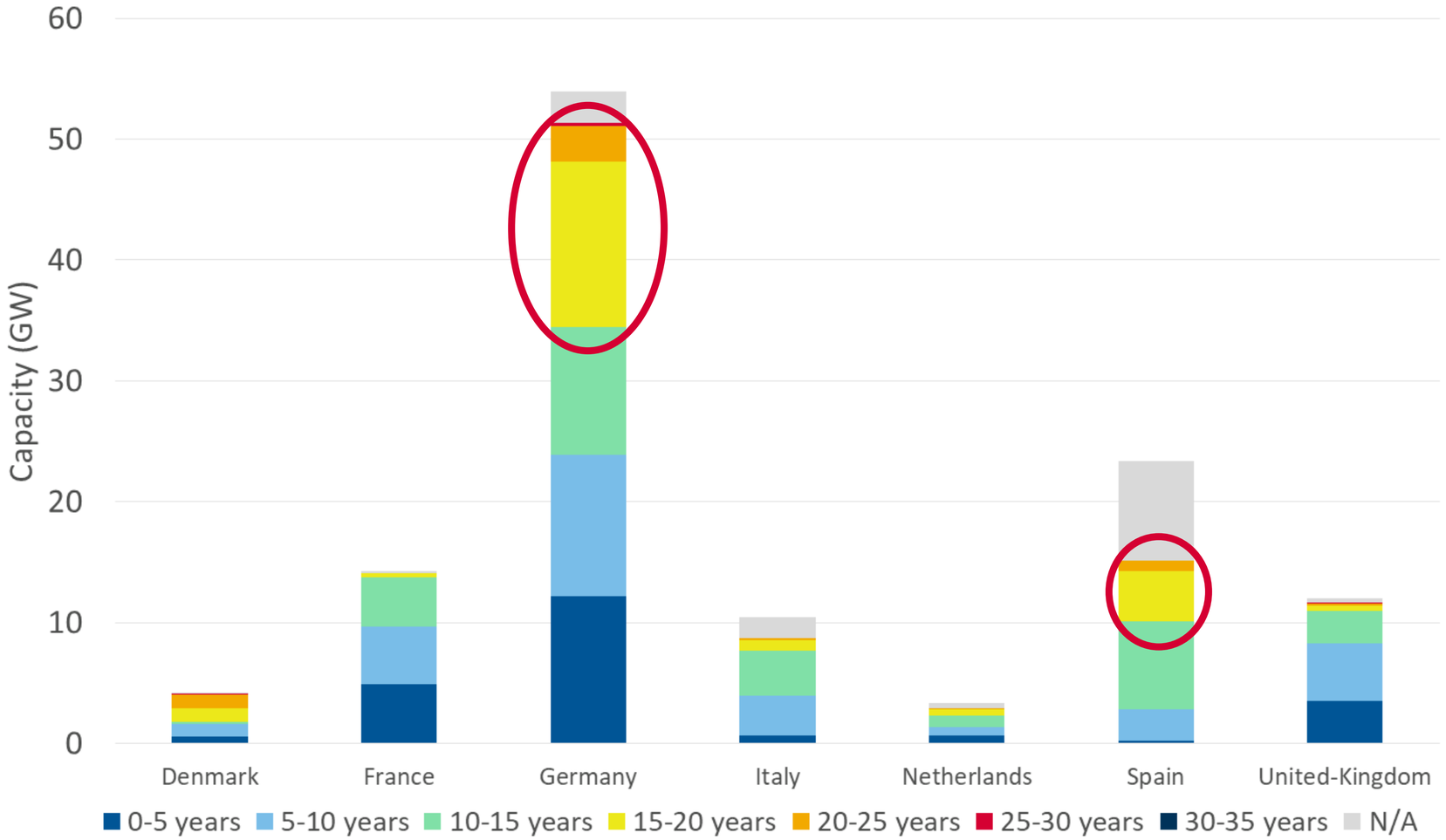
Ageing onshore wind fleet



Up to 15,000 blades could be decommissioned.

More than 16 GW in Germany are over 15 years old



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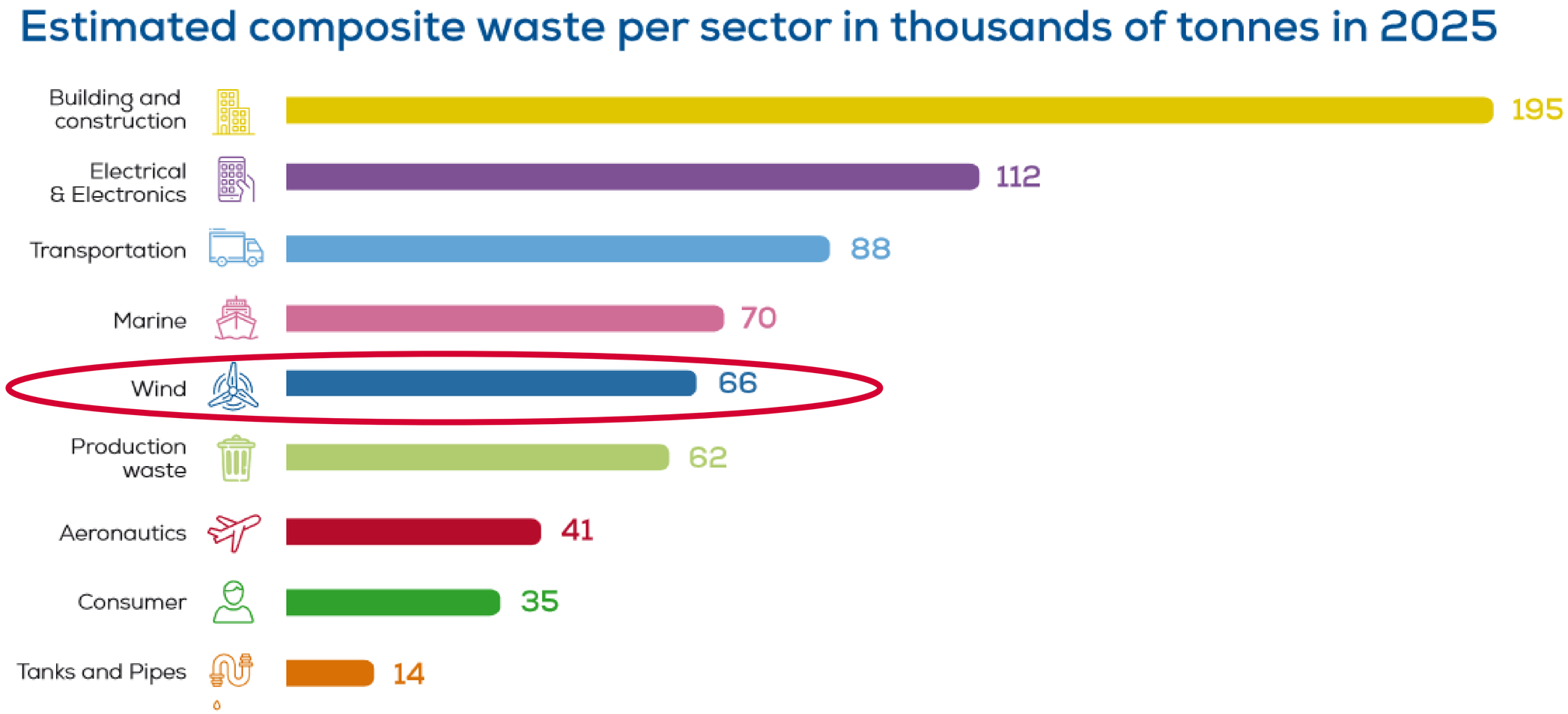
Ageing fleet increases need for waste management solutions



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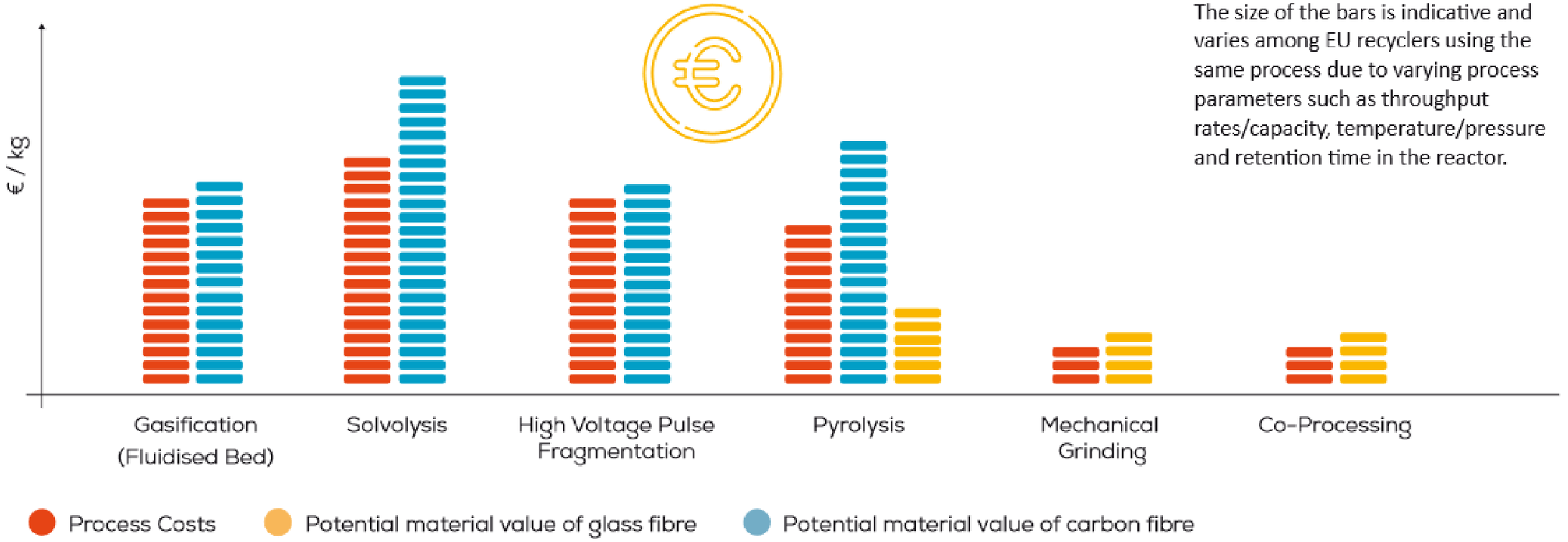
Only a few economically viable solutions available

Estimated relative costs and values of composite recycling technologies



The size of the bars is indicative and varies among EU recyclers using the same process due to varying process parameters such as throughput rates/capacity, temperature/pressure and retention time in the reactor.

Circularity in the technology roadmap

Blade recycling (demonstration)

Short term | High priority

Description and scope

The volume of blades produced and delivered to the market has increased over the last many years due to the exponential growth of the wind energy sector. Many turbines will soon reach the end of their operational life and will have to be decommissioned. While there are good ways of recycling many of the metal parts of a wind turbine, there is still no industrialised method to recycle wind turbine blades as they have a complex material structure (resins, composites, etc.).

Hence, blades at the end of their designed lifetime often end up as landfill or incineration, which is a sub-optimal use of precious resources and materials. A large scale demonstration of recycling of wind turbine blades including business cases for industrialization hereof will improve wind turbine circularity, offer new opportunities for re-use of materials by other sectors and provide the wind energy sector and other composite heavy sectors with ready solutions to manage upcoming volumes of composite waste.

Recommended research actions

- Development of financial model for recycling of wind turbine blades.
- Assessment of different methods of recycling of wind turbine blades according to developed financial model.
- Demonstration of industrialised recycling of wind turbine blades scalable to the coming volumes of end-of-life blades.
- Demonstration of re-use of materials from recycled blades.

Milestones

- Industrial scale demonstration facility of composite waste recycling dedicated to wind turbine blades by 2022.
- Cross-sectoral pilot project on the re-use of recycled composite materials from wind turbine based by 2024.

Development of sustainable materials

Medium term | High priority

Description and scope

Wind turbine blades are composed out of many materials, but the majority of them are fibre reinforced plastics (FRP). Currently glass fibres are the most used reinforcement fibres, but carbon fibres have already been introduced for longer blades to reduce weight.

Most, if not all the resins used are thermoset type resins such as polyester, vinylester or epoxy. Recycling of FRP from past and current state of the art wind turbine blades is difficult due to the chemical bonds of the fibers with the plastic and resins.

New sustainable materials fit for use in blades for wind turbines must be developed. The development of these new sustainable materials must be performed in a circular economy framework securing future wind turbine blades, which are sustainable in relation to economy and resources.

Recommended research actions

- Mapping and evaluation of sustainable material system potential suitable for use in manufacture of wind turbine blades.
- Development of new high-performance materials matching or better outperforming current state of the art materials for wind turbine blades and securing full sustainable and easy recycle blades at end of life.
- Demonstration of the new developed materials in sustainable design of wind turbine blades.

Milestones

- Mapping and evaluation of sustainable material system potential suitable for use in manufacture of wind turbine blades completed.
- Development of new high-performance materials matching or better outperforming current state of the art materials for wind turbine blades completed.
- Demonstration of the new developed materials in sustainable design of wind turbine blades.

Recycling methods for materials and components

Long term | High priority

Description and scope

Multiple methods for recycling of fibre reinforced plastics (FRP) have been investigated, however only a few have a high technology readiness level (TRL) and have been demonstrated at commercial scale (pyrolysis and cement kiln). Full financial assessment of different methods of recycling of wind turbine blades is needed to find optimal solution for future volumes of end-of-life blades. Further market barriers for commercialisation of recycling of wind turbine blades/FRP have to be identified and eliminated to turn recycling of wind turbine blades into a profitable business to the benefit of society and environment.

Recommended research actions

- Assessment of different recycling methods in a commercial and industrialised framework.
- Identify market barriers for comercialisation of recycling of wind turbine blades and generate recommendation to eliminate those.

Milestones

- Assessment of different recycling methods in a commercial and industrialised framework completed.
- Market barriers for commercialised of recycling of wind turbine blades identified.
- Recommendation to eliminate market barriers defined.

EU Research & Innovation policy

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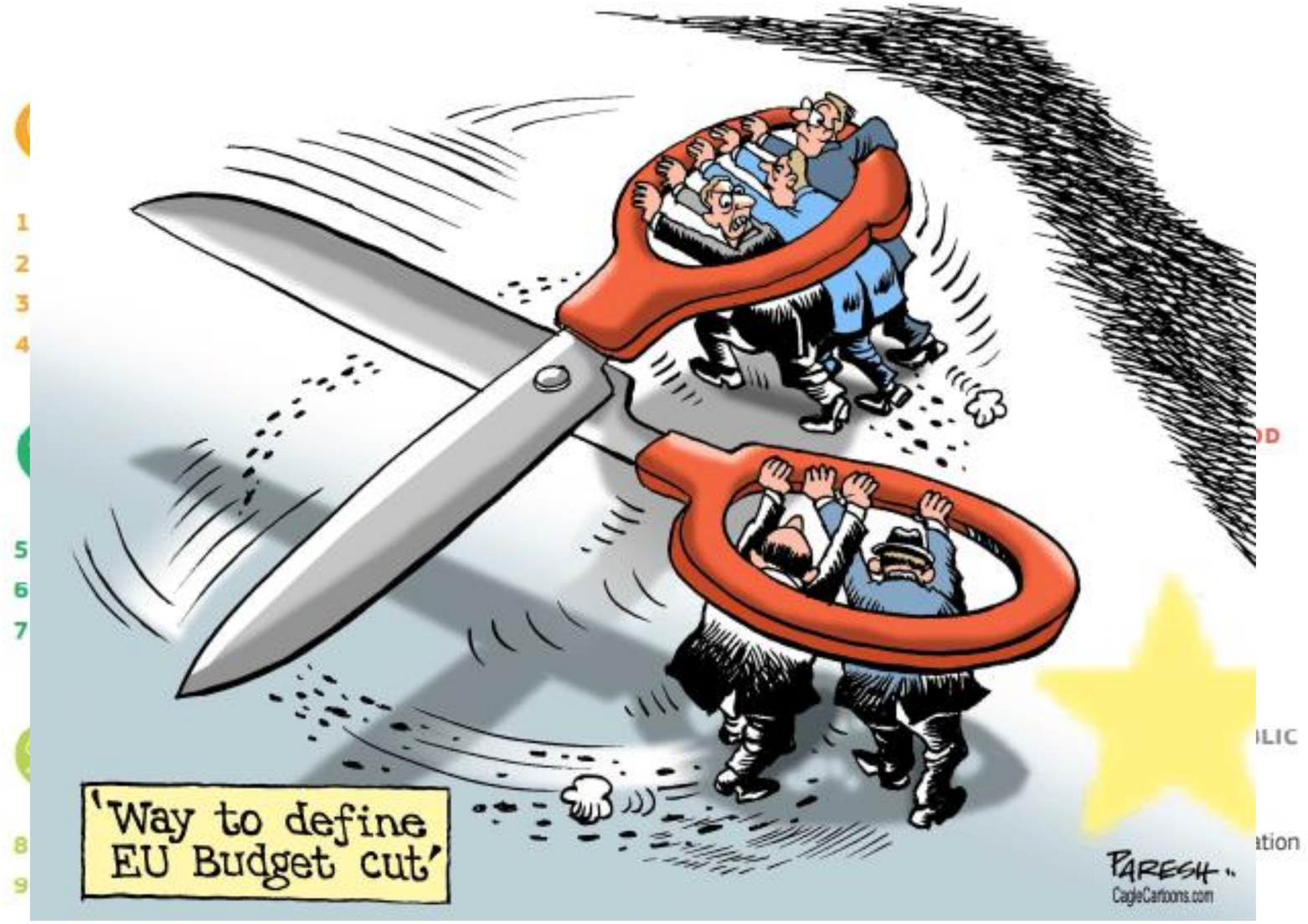
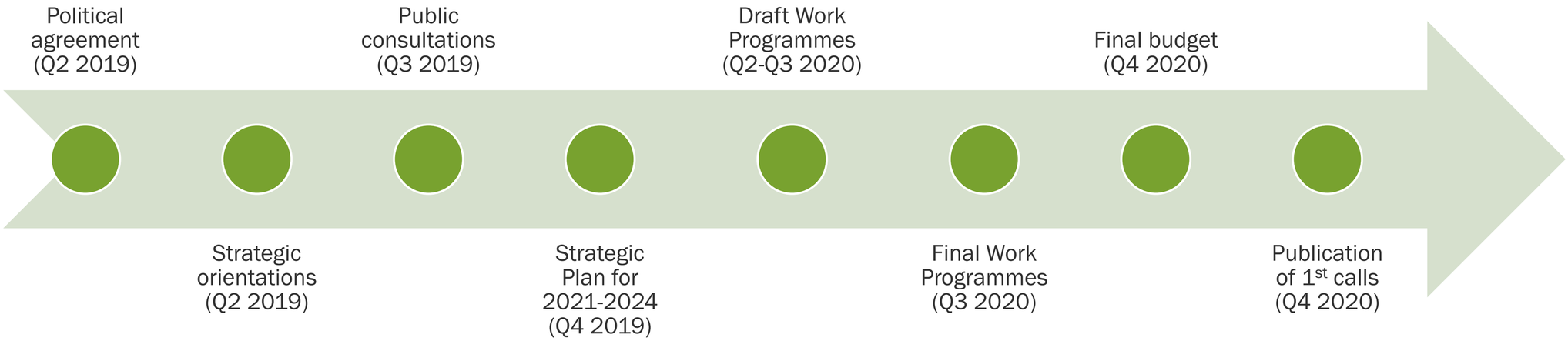
Proposed EU budget for 2021



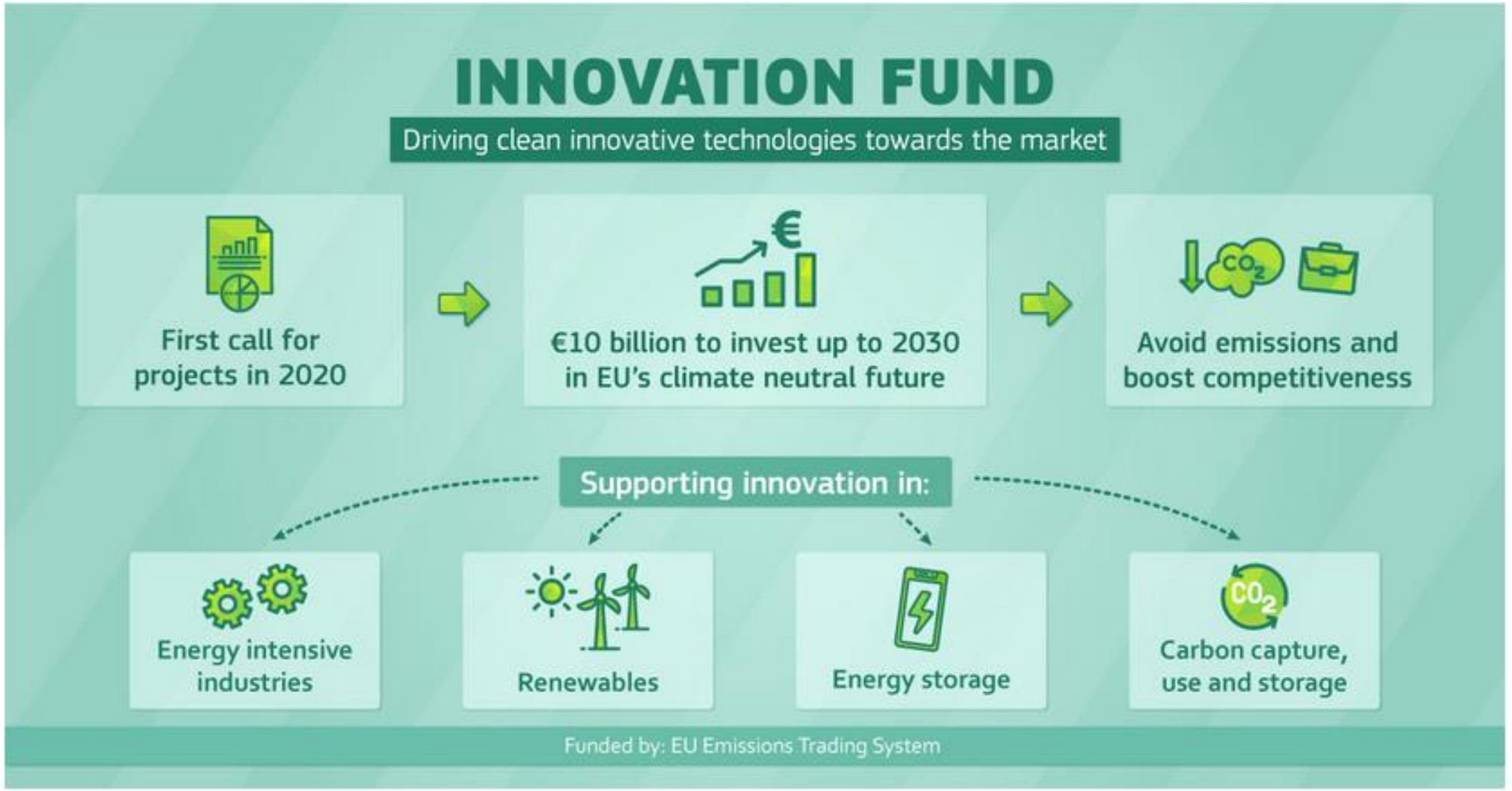
Horizon Europe timeline



Horizon Europe strategic plan on Climate, Energy & Mobility

1. Climate science
2. Cross-sectoral solutions for decarbonisation
    1. Batteries
    2. Hydrogen
    3. Infrastructure (cities)
    4. Emerging breakthrough technologies (e.g. DACCS)
3. Net Zero-GHG emission energy system centred on renewables (RES)
    1. **Global leadership in RES** (support to wind and solar, portfolio diversification, fuels)
    2. Grids
    3. CCSU (in power sector and industry)
    4. Energy Storage
4. Demand side solutions
5. Low carbon transport
6. Smart mobility

Innovation Fund



Innovation Fund – our five recommendations

1. Align with the wind industry's recommendations from **strategic research and innovation agenda** (SRIA);

2. Address the so-called "**valley-of-death**" in financing (the period between demonstration and final investment decision);

3. Provide **fit-for-purpose upfront investment** as early as possibly in the project;

4. Include **thresholds** for funding; and

5. Focus on **replicable projects** that boost **industrial competitiveness**.

Vision document

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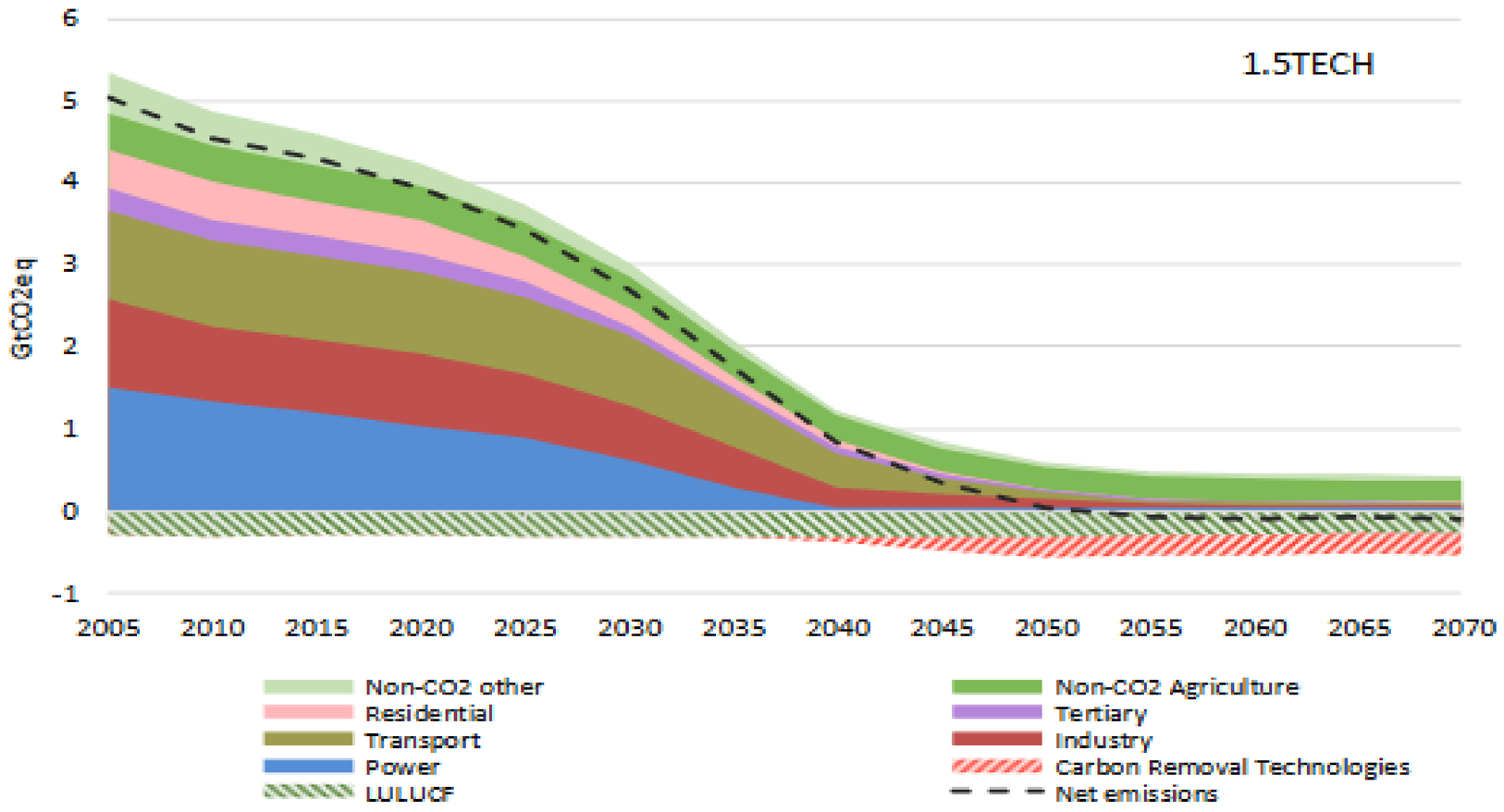
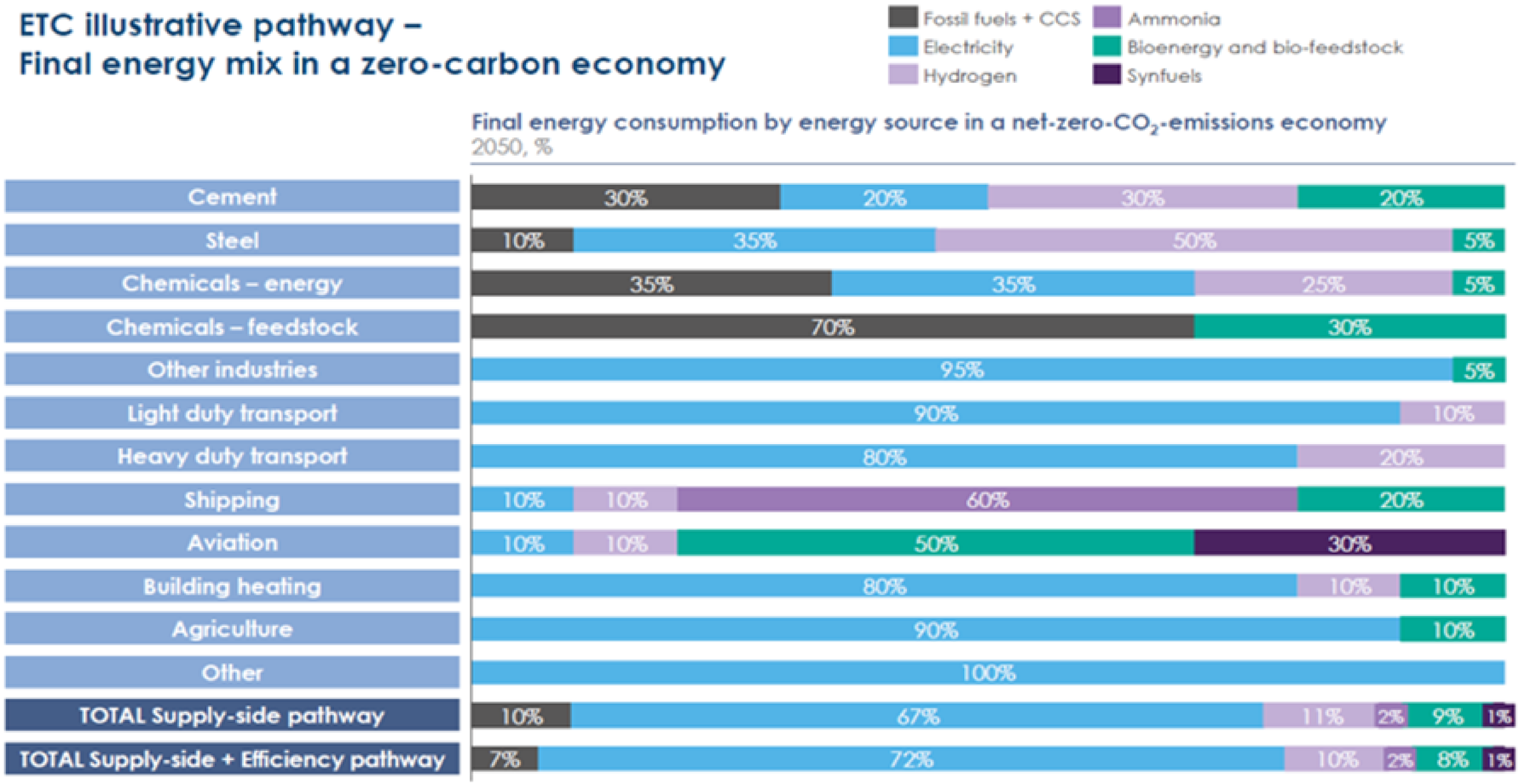
LONG TERM STRATEGY (TOWARDS CARBON NEUTRALITY?)



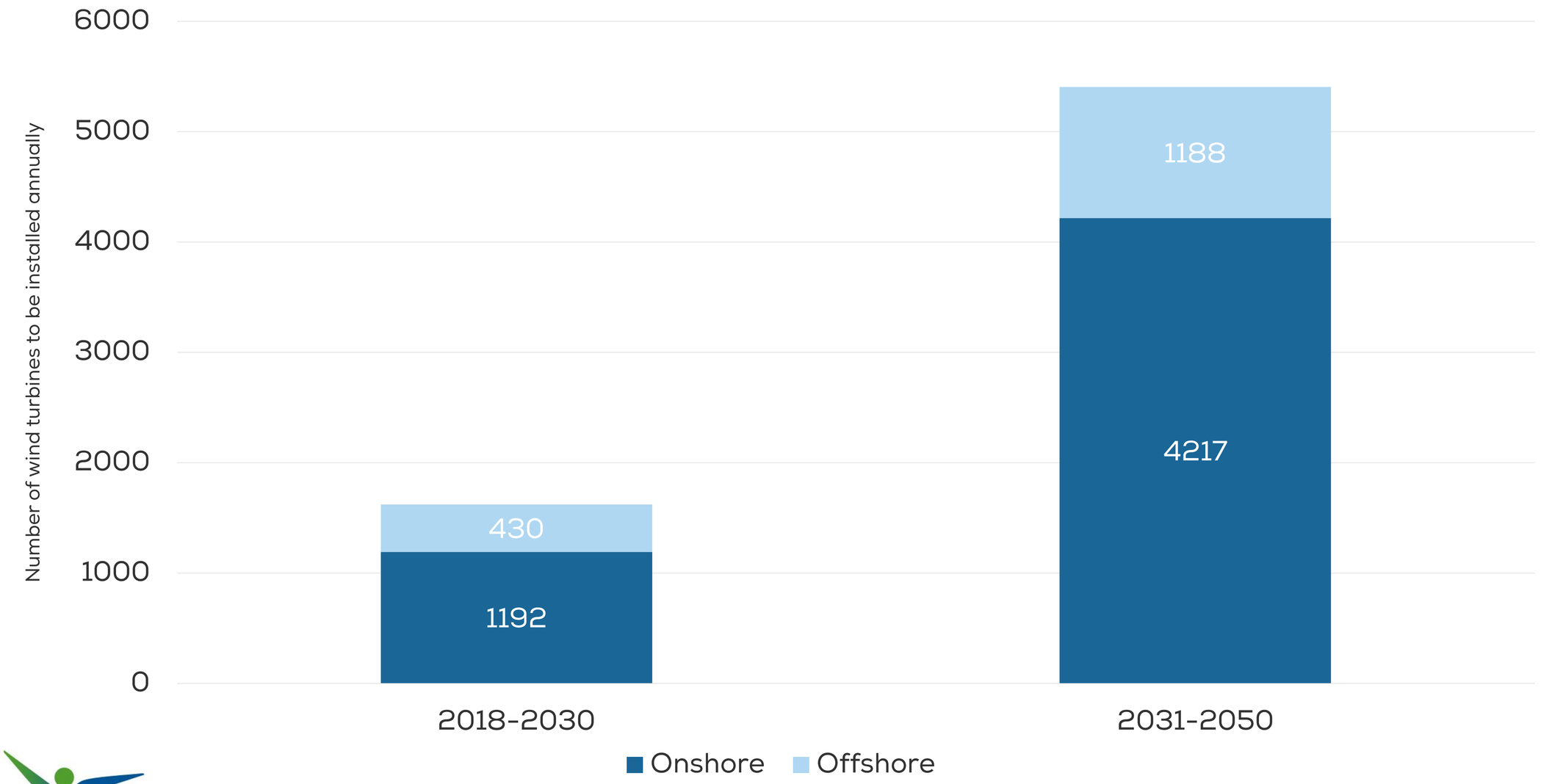
Source: European Commission

EFFECT OF CARBON NEUTRALITY ON THE ENERGY MIX



Source: SYSTEMIQ analysis for the Energy Transitions Commission analysis (2018)

R&I NEEDED TO ACCELERATE LARGE-SCALE DEPLOYMENT



Assumed average wind turbine nominal capacity: 4MW (onshore) and 10MW (offshore) for 2018-2030 and 6MW (onshore) and 16MW (offshore) for 2031-2050.

Structure

- Climate and energy policy.
- Renewables-based electrification.
- Challenge 1: Deploying volumes requires investments in:
  - Technology;
  - People; and
  - Infrastructure.
- Challenge 2: Towards a system fit for 100% renewables:
  - Integration into existing grid;
  - Get wind to become the backbone of future system,
- Collaboration with Academia.
- Conclusion.

Open questions for discussion

- Who is the audience?
- What action should result from this?
- Can we be more fact and evidence based on industry impact?
- Can we shed more light on the technologies/products needed and why?

Deploying large volumes offshore – identifying supply chain bottlenecks

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Skills and human resources

A shortage of skilled personnel is often cited as one of the main bottlenecks in the offshore supply chain. Is it more a matter of skills (education)? Or of qualification (re-training)? What engineering and technician profiles are hardest to find?

Logistics and manufacturing

How will increasing distances (wind farms being deployed further from shore and further from each other) affect installation logistics and costs? Will we see the emergence of large portside manufacturing hubs or rather an increase of modularised construction with final assembly in port areas?

Interarray/export cables

Should the industry start thinking about new connection concepts and/or higher voltage ratings? If so, what are the main technical challenges for the adoption of new, higher, AC voltages? Are these technologies market-ready?

Interarray cables

Could DC deliver cost-benefits over AC interarray topologies and is the current drive train design compatible to deliver a different topology (DC, higher voltage, etc.) without compromising the cost?

Enhancing circularity in the European wind industry

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Rare earth minerals

How will the trend in PMSG be affected by the rare earth mineral market, knowing 70% of rare earth minerals come from China? How do we reduce European dependency? Should we focus research on alternative materials or on material efficiency and recycling? Or, will other drivetrain concepts (EESG) regain market share?

Lead

Development of lead-free cables (at similar cost levels) by 2024 is a medium priority within the ETIPWind Roadmap. What is the current technology readiness level of lead-free cables? How realistic is wide-spread market uptake of lead-free alternatives by 2024 and by 2030?

Lead

In a scenario where European cable manufacturers are banned from making lead-based export cables lead, but companies from the wind energy sector can still use lead-based export cables (by an individual “authorisation of use”). What would the overal cost impact of importing export cables, notably from China, be?

Survey on R&I spending

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Ensuring effective R&I policy on wind energy

Obligations

- Monitor the R&I productivity (amount of funding received and topics financed thanks to the SRIAs) and the influence on R&I funding development in the sector.
- Provide an overview and description of annual corporate R&D spending in line with SRIA/Technological Roadmap/SET Plan.
- Increase alignment of private sector research funding with ETIPWind priorities.

Proposed actions

- Circulate an annual, anonymous survey to industRY members asking them:
  - How they are implementing the priorities stipulated by ETIPWind and the SET Plan; and
  - How much financial resources they commit to the relevant priorities (rough estimation)
- Analysis of all stakeholders' contribution in implementing:
  - The ETIPWind Roadmap; and
  - The SET Plan Implementation Plan on offshore wind.

Gathering anonymised survey data

OBJECTIVE:

- Confidential collection and aggregation of sensitive data

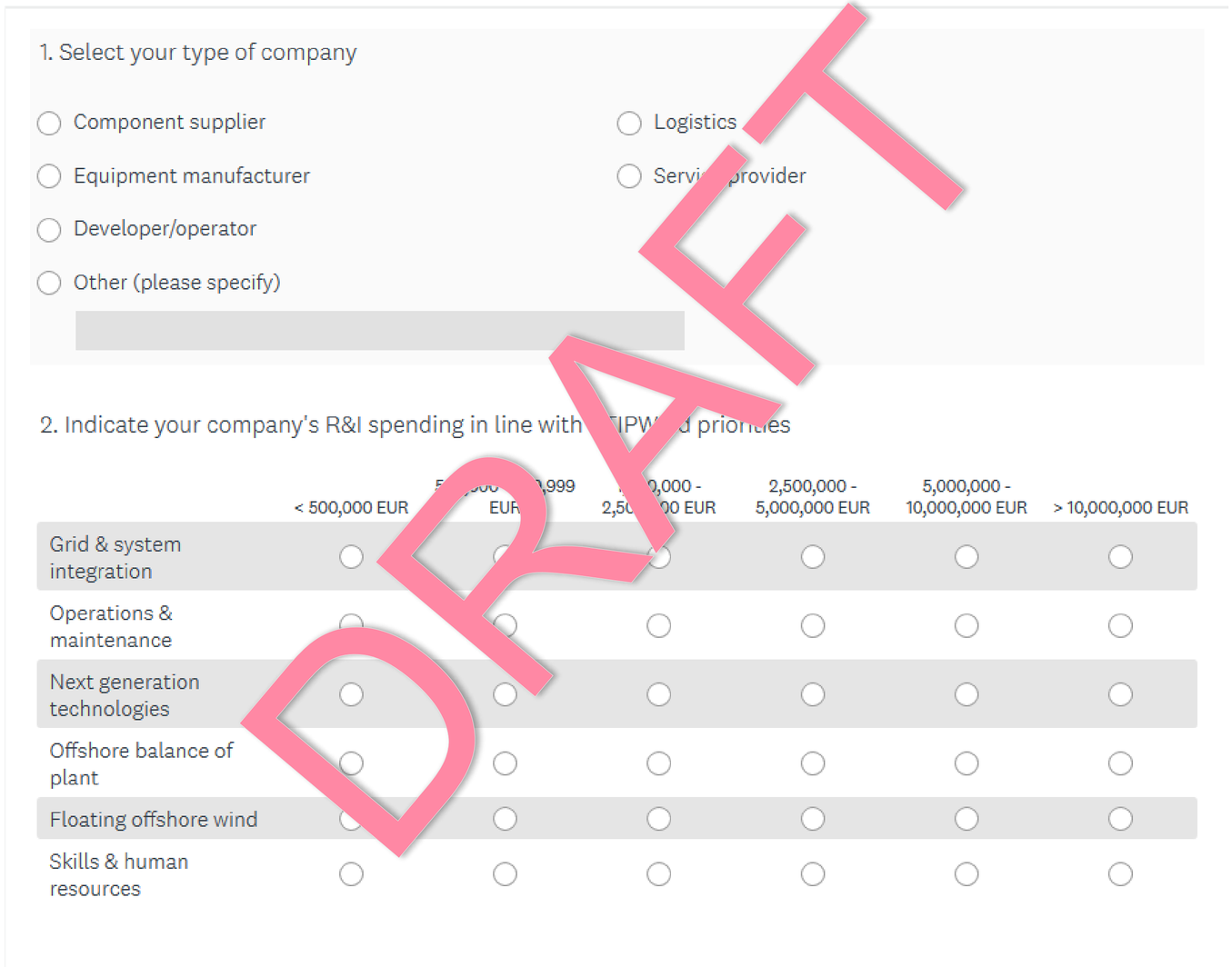
INPUT:

- Email addresses stored.
- New survey: anonymised user names generated.
- Data entered to unique URL protected by password generated with survey.

OUTPUT:

- Responses aggregated and only visible once minimum three responses.
- Minimum four responses needed to use data.

How would it work?



1. Select your type of company

- ◯ Component supplier
- ◯ Logistics
- ◯ Equipment manufacturer
- ◯ Servi… provider
- ◯ Developer/operator
- ◯ Other (please specify)

2. Indicate your company's R&I spending in line with …IPW… priorities

	< 500,000 EUR	5… EUR	…0,000 - 2,5… 00 EUR	2,500,000 - 5,000,000 EUR	5,000,000 - 10,000,000 EUR	> 10,000,000 EUR
Grid & system integration	◯	◯	◯	◯	◯	◯
Operations & maintenance	◯	◯	◯	◯	◯	◯
Next generation technologies	◯	◯	◯	◯	◯	◯
Offshore balance of plant	◯	◯	◯	◯	◯	◯
Floating offshore wind	◯	◯	◯	◯	◯	◯
Skills & human resources	◯	◯	◯	◯	◯	◯

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