

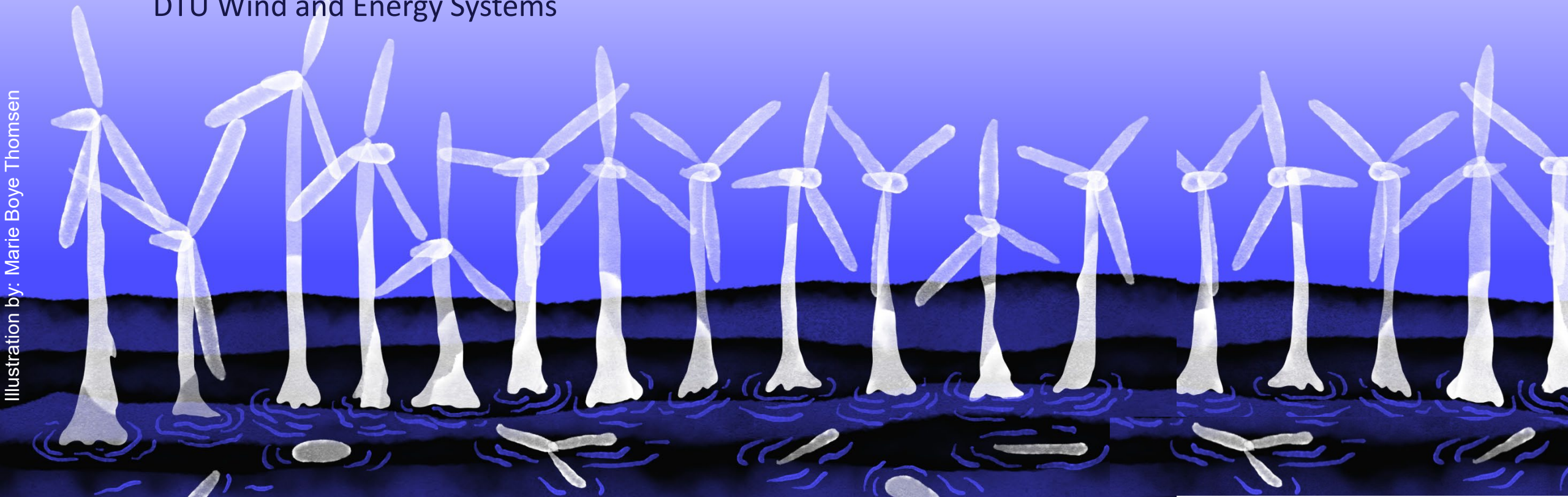


IEA Wind Task 45 – Enabling the recycling of wind turbine blades

22.11.2022

Justine Beauson

DTU Wind and Energy Systems



IEA Wind TCP

International Energy Agency Wind Technology Collaboration Programme

Share information and research activities to advance wind energy deployment.

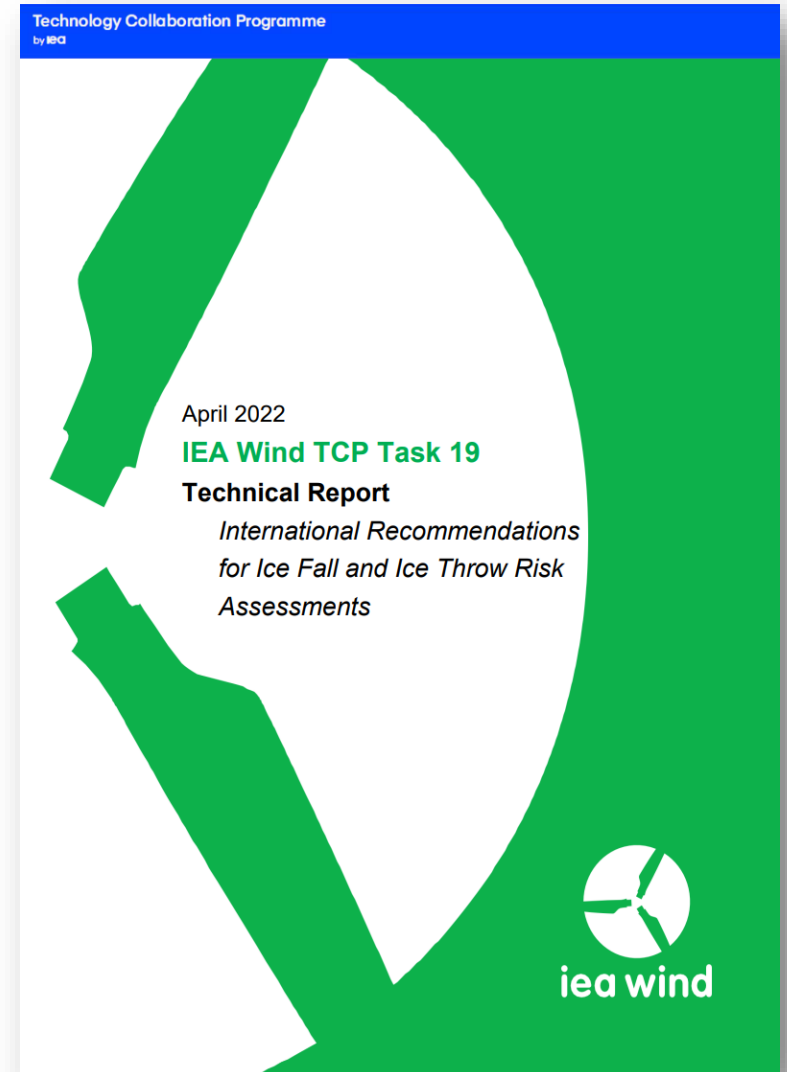
1977, it was founded;

23 countries and sponsor members;

24 active IEA Wind tasks in **5** different themes;

Advanced Technology, Communication, Education and Engagement, Energy Systems with High Amounts of Wind, Resource, Site Characterisation and External Conditions, Social, Environmental and Economic Impact

Technical reports, fact sheets, and recommended practices are released publicly to benefit the wind energy community.



Motivation for the task

The amount of end of life wind turbine blade will increase significantly in the coming years (Europe, USA, China will be the first ones).



A lot of research on recycling is ongoing, however only few recycling solutions are available.

Motivation for the task

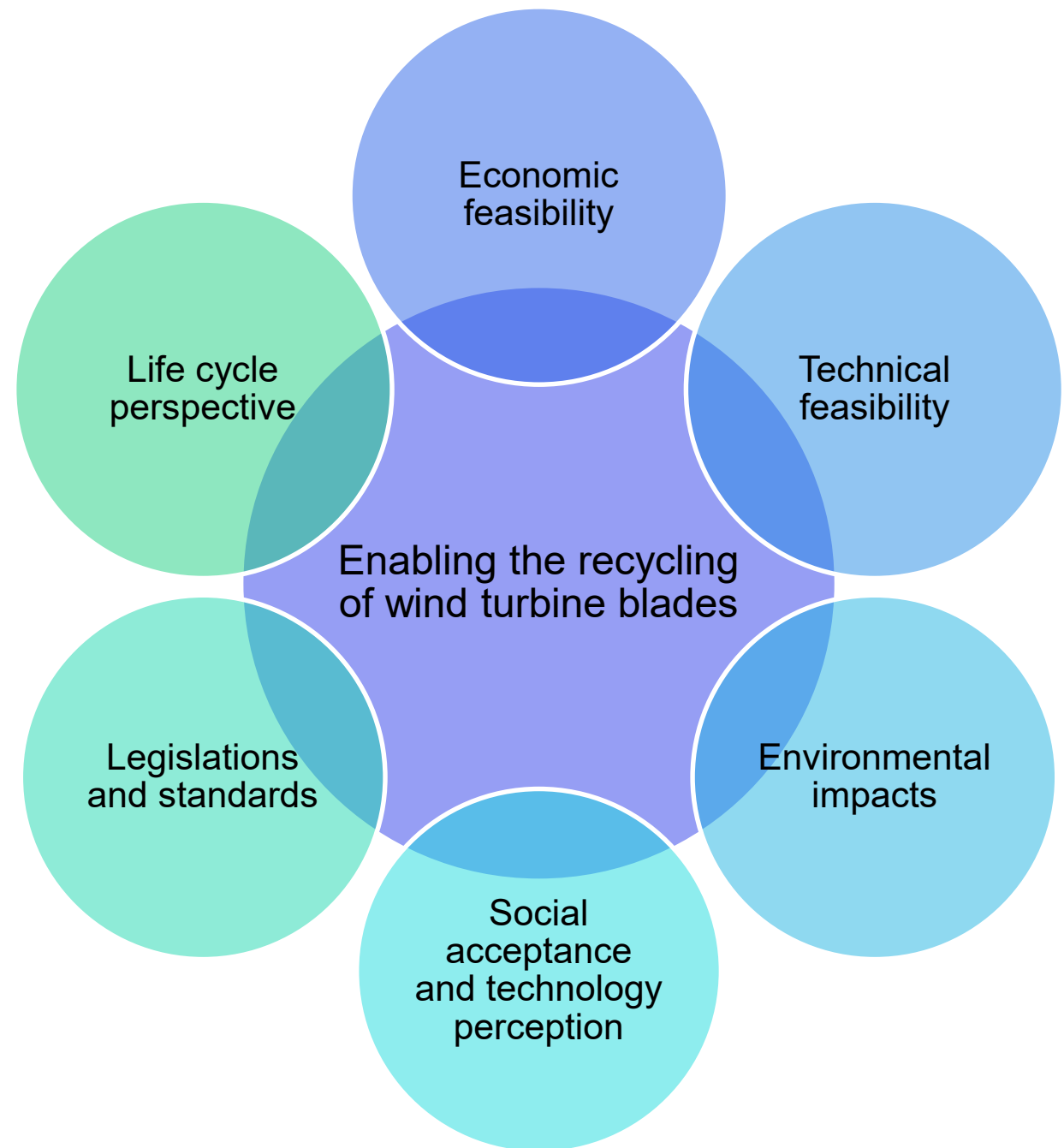
Challenges:

- Missing guidance on end of life blade treatment (wind turbine owners);
- Challenges in establishing successful recycling value chains (value of recycled material, demand for recycled materials, cost of recycling,..);
- Difficulties in upscaling recycling processes;
- Lack of knowledge in environmental impacts of recycling solutions;
- Lack of guidance in the selection and the establishment of recycling solution (recycling industry).

Purpose of Task 45

Identify the barriers, levers and mitigation strategies for the implementation of large scale wind turbine blades recycling solutions.

Multidisciplinary approach



Goals

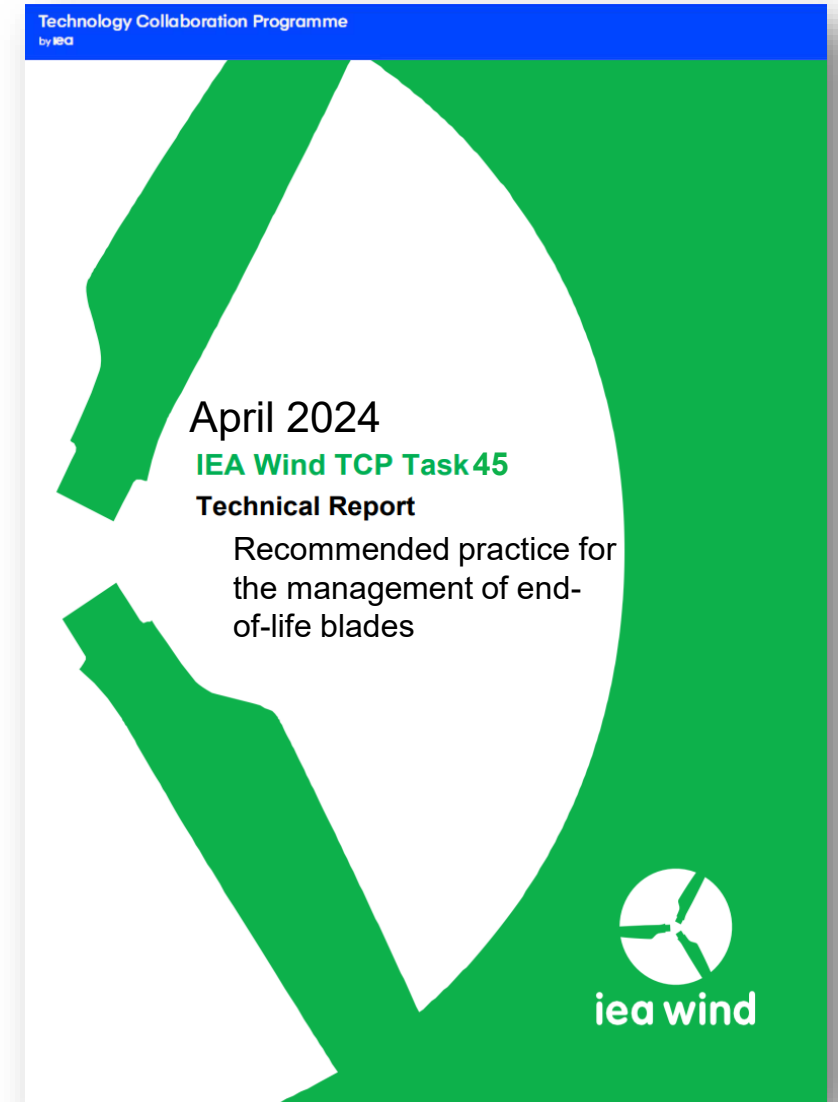
Establish best practice for the management of end of life blades (also incl. social and environmental impacts) // Wind turbine owners

Guidance on upscaling recycling processes and establishment of recycling value chains // Recycling industry

Task Length: 3 years starting in May 2021

Work Package structure

- WP1 Management, coordination and dissemination
- WP2 Technical focus
- WP3 Blade life cycle and Value chain
- WP4 Standardization, certification and legislation focus



IEA Wind Task 45

Steering committee



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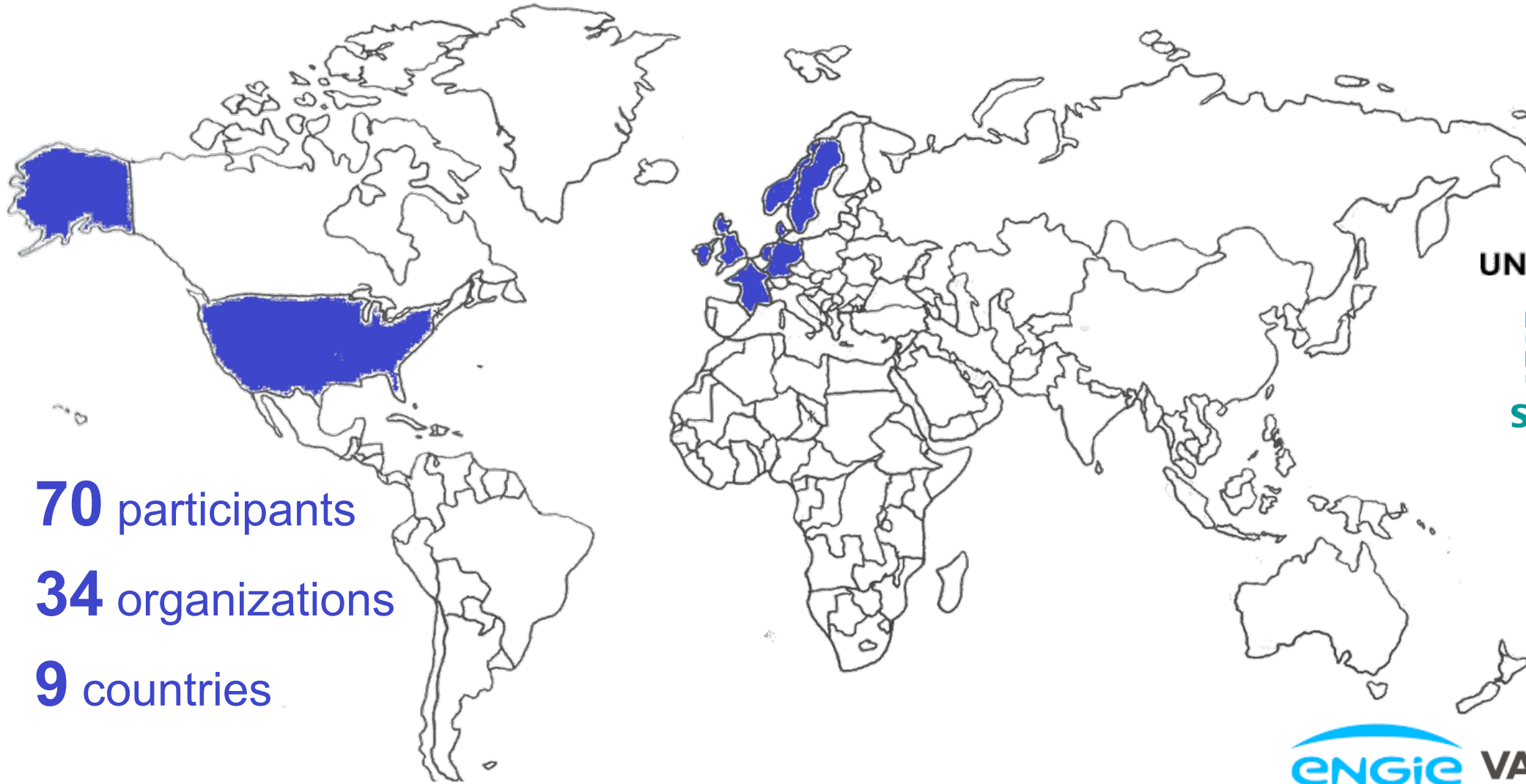
Kevin
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Leeds*

IEA Wind Task 45

Participants



70 participants
34 organizations
9 countries



Participants in Task 45

Industries:

- Wind farm owners
- Wind turbine manufacturers
- Industries from the recycling sector
- Polymer resin manufacturers

Associations:

- Wind industry associations
- Circularity hub

Universities specialised in:

- Blade design
- Composite materials
- Composite recycling
- Analysis (LCA, LCC, CE,...)

What do we want?

Participants involved in the task want:

1. To be able to compare end of life solutions for blades: how much does it cost? How much CO2 is emitted? How much blade material can it take? Where is the solution located?.... => Guidelines
2. Network: Promote their product (a harbour to locate a recycling business, a new resin branded recyclable, a new recyclable wind turbine blade,...), Find partners for projects,...

Deliverables in IEA Wind Task 45

Deadline	Deliverables	WP and coordinator
May 2022	Review of existing legislations and standards on the end-of-life of wind turbines	WP4 DNV
November 2022	Review of research Design for recycling	WP2 Fraunhofer IWES
	Review of research all end-of-life solutions (incl. economic, social and environmental impacts)	WP2 & 3 NCC and UCC
May 2023	Guidelines Establishment of recycling value chain	WP2 & 3 NCC and UCC
	Guidelines Legislation on end of life wind turbine blade waste for countries	WP4 DNV
November 2023	Review of Life cycle costing and circular economy on the end-of-life of wind turbines	WP3 UCC
April 2024	Guidelines for the upscaling of recycling processes	WP2 & 3 NCC and UCC
	Recommendations for the design of future blades and future recycling methods	WP2 Fraunhofer IWES and NCC
	IEA Wind Task 45 Guidelines on end of life	ALL

Deliverables in IEA Wind Task 45

WP4 Standardization, certification and legislation focus



Kevin Smith
DNV



Colin Mackie
Uni. Leeds

Wind Turbine Blades at End-of-Life:

a preliminary summary of policies, legislation, guidelines, and initiatives that address reuse, recycling, repurposing, and disposal

IEA Wind Task 45 – Work Package 4

Hard Law Measures: enforceable laws/regulations

Soft Law Measures: publicly announced, non-binding initiatives

Tender Requirements: provisions that address EoL issues/actions in tenders

Deliverables in IEA Wind Task 45

WP2 Technical focus



Steffen
Czichon
Fraunhofer
IWES

**A review of the current state of blade design and novel materials research
for improved recyclability of wind turbine blades**

Steffen Czichon^{1*}, Niels Ludwig¹, Philippe Spring², Marco J. Echeverria¹

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² TPI Composites, Berlin, Germany

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Review of the literature: novel materials and blade design for improved blade recyclability.

Identify and discuss: possible associated recycling processes and barriers that may arise.

Reviews: core materials, fibres, adhesives and resin systems, self-healing composite and future concept.

Deliverables in IEA Wind Task 45

WP2 Technical focus

WP3 Blade life cycle and value chain



James
Lightfoot
NCC



Paul Leahy
UCC

IEA Wind Task 45 Wind Turbine Blade Recycling
Deliverable 2.2

Blade End-of-Life Treatments: State of the art, Challenges, Barriers, Environmental and Social Impacts

Audience: wind turbine and windfarm owners

Reviews: Overview of existing technology, Current technical status, ongoing and future developments, include energy use, carbon intensity and cost.

Authors	Organization and country
Paul Leahy	University College Cork (IE)
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IEA Wind Task 45 and more..?

- A network and a community ?
- A knowledge Base?
- Decision tool to compare end-of-life solutions?
- Road mapping the next steps?
- Recommendations and scientific publications?
- Forming new project proposal?




Examples of other tasks – Knowledge Base

Task 34 WREN - Working Together to Resolve Environmental Effects of Wind Energy

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About WREN

Working Together to Resolve Environmental Effects of Wind Energy (WREN)



ENGAGE

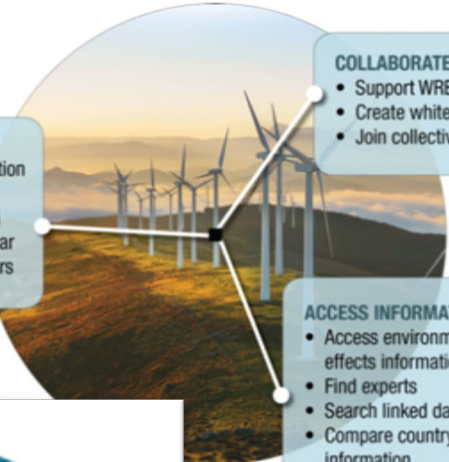
- Share research information
- Track ongoing research
- Connect to social media
- Managed events calendar
- Convene topical webinars

COLLABORATE

- Support WREN meetings
- Create white papers
- Join collective workspace

ACCESS INFORMATION

- Access environmental effects information
- Find experts
- Search linked databases
- Compare country-specific information



Contents

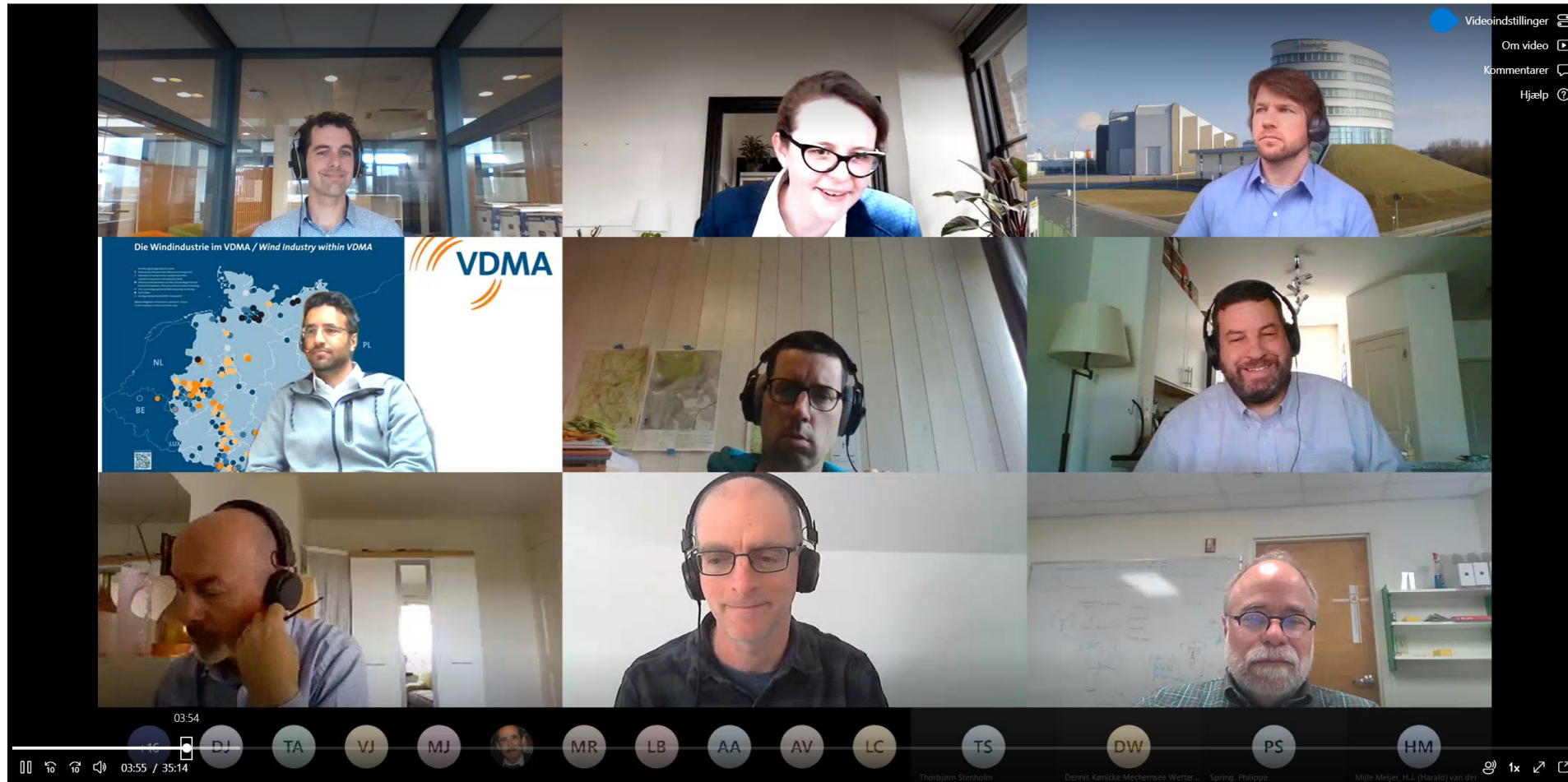
- **WREN White Papers & Publications**
- **WREN Short Science Summaries**
- **Monitoring and Mitigation Technologies Tool**
- **WREN Webinars**
- **Knowledge Base and Map Viewer**
- **WREN Meetings**
- **WREN Partners**
- **Contact Information**

Knowledge Base

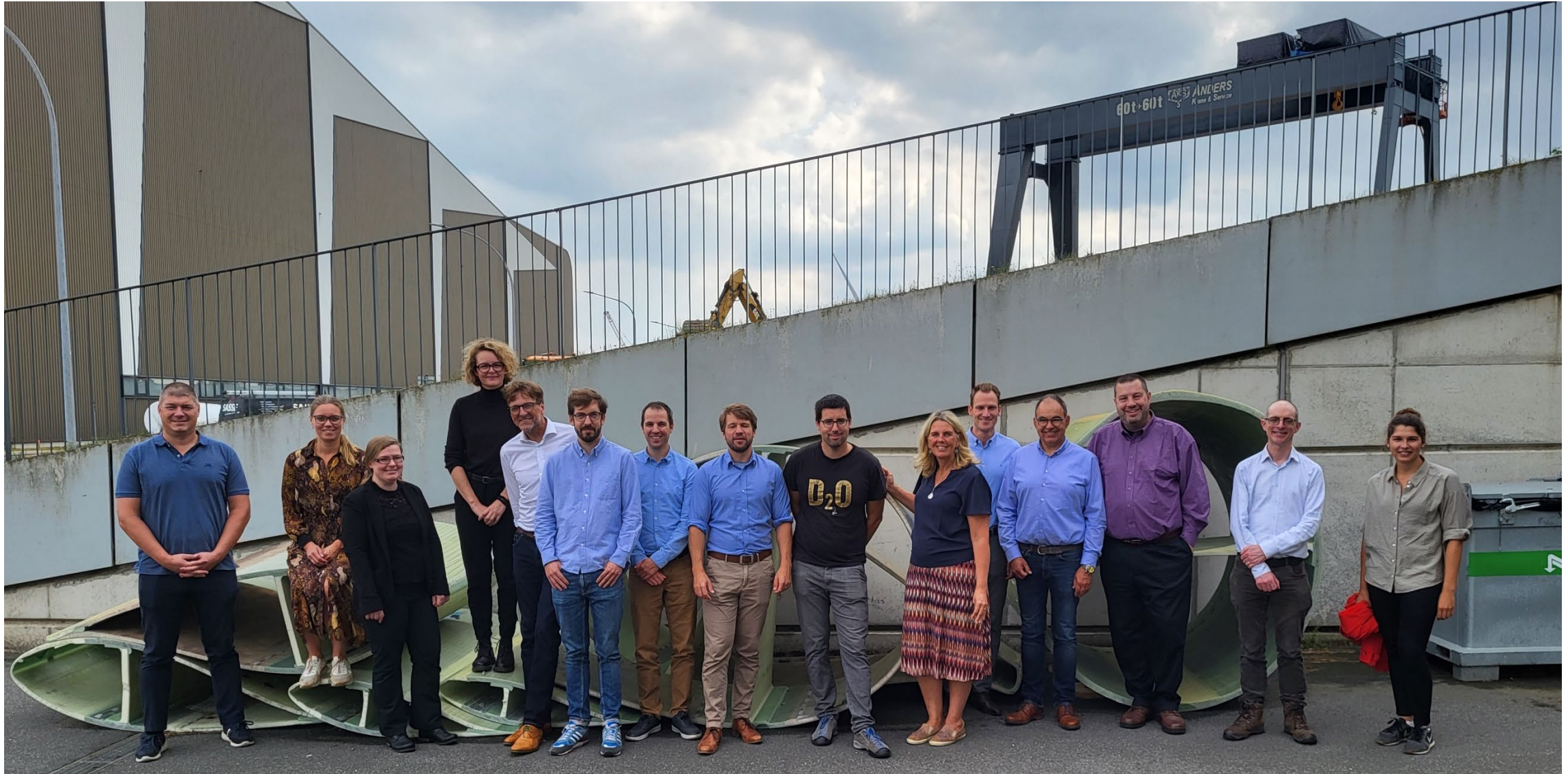
Access thousands of publications and more, all in a searchable database.

Meeting online and in person

General assembly meeting May 2022 – Online – 42 participants



Next general assembly meeting: 6.12.2022



First physical meeting – Septembre – 2022 Fraunhofer IWES – Germany

Thank you for your attention!

Interested to join the IEA Wind Task 45?

Write to us!



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