IEA Wind TCP Task 32

Wind lidar for wind energy applications

Workshop on the future of the Task (2022-25)

Andy Clifton, David Schlipf, Julia Gottschall · 04 August 2021

www.iea-wind.org/task32

DOI 10.5281/zenodo.5163487

task 32
lidar

Today's agenda

:02	Welcome
:04	Presentation of the new Task 32 concept
:15	Q&A
:20	Breakout rooms – tell us your opinions
:40	Summary of feedback (from room moderators) and next steps

Dr. Andrew Clifton
University of Stuttgart

Prof. Dr. David Schlipf
University of Flensburg

Dr. Julia Gottschall
Fraunhofer IWES

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Where we are today

Ryan Duffy on Unsplash

Where we are today

Photo from AXYS Technolgies via NREL

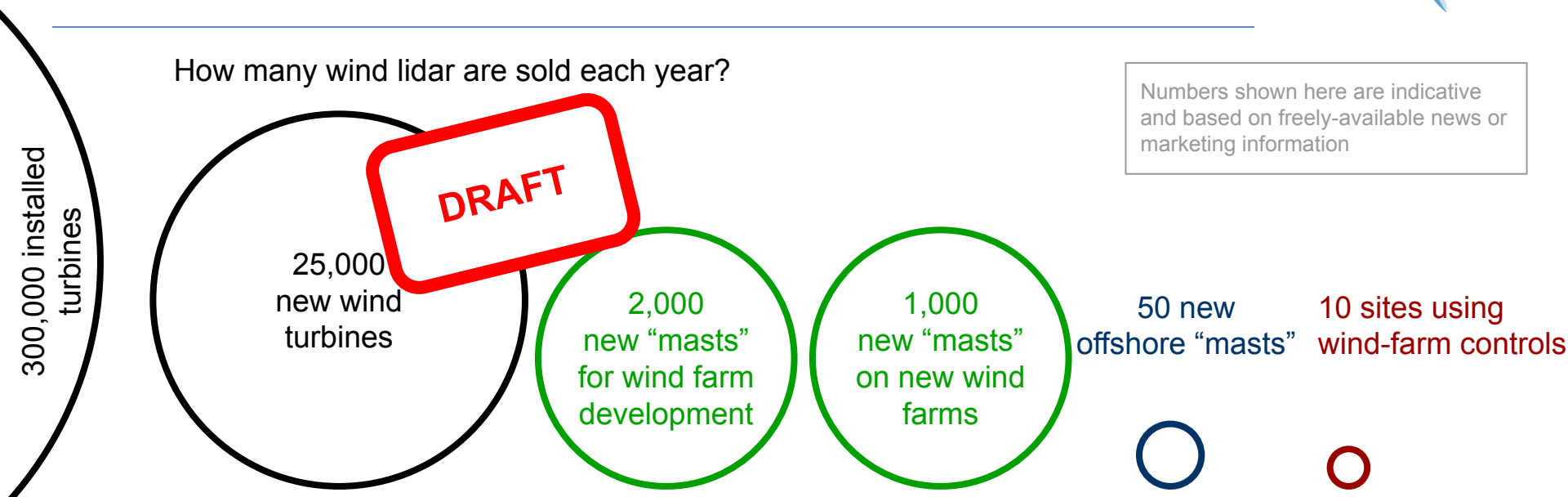
Where we are today

Photo by Dennis Schroeder / NREL

The 2021 lidar market

How many wind lidar are sold each year?

Numbers shown here are indicative and based on freely-available news or marketing information

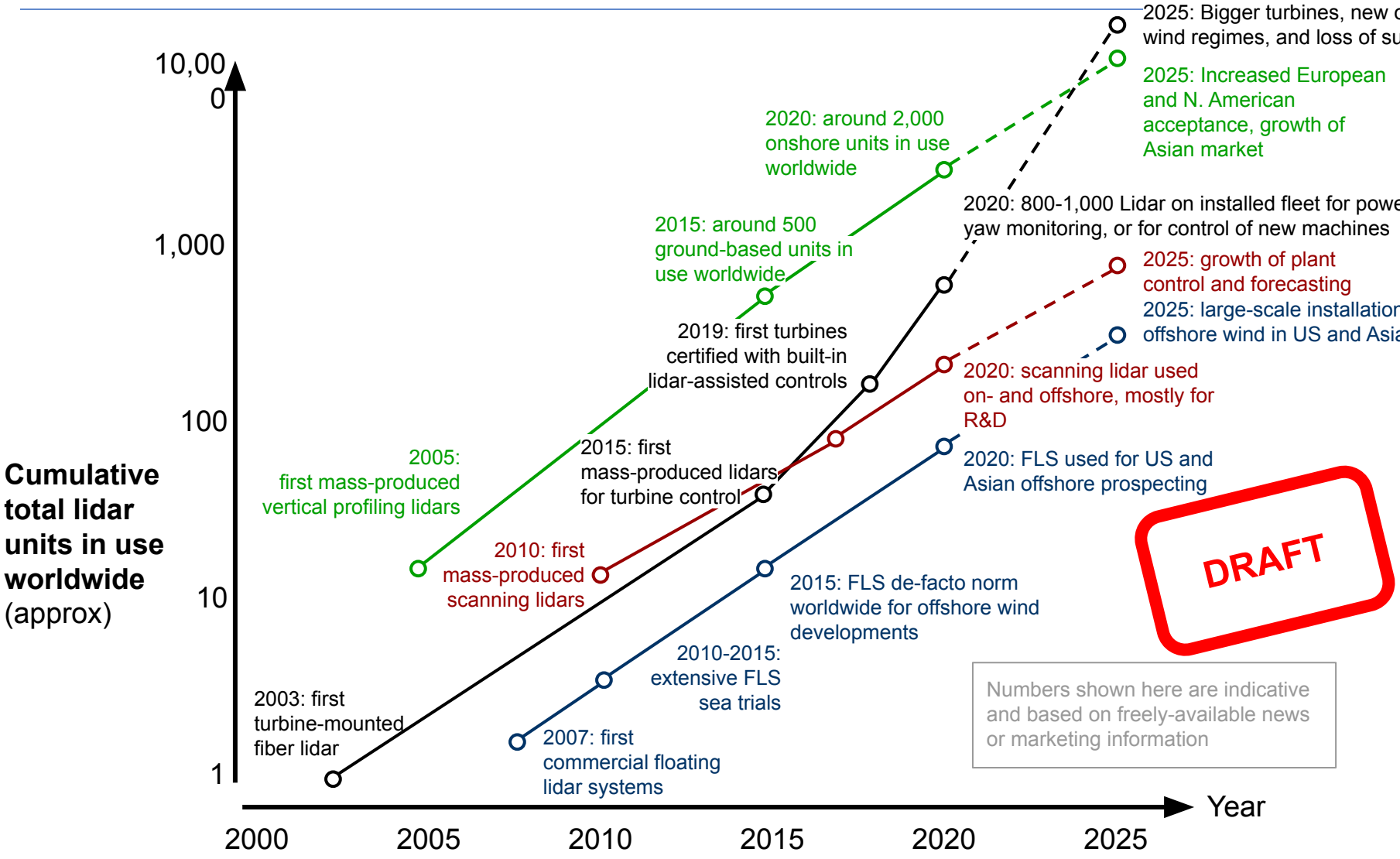


New lidar for .1% of installed turbines	Lidar on 1% of new turbines	Lidar replacing 10% masts in Europe & N. America, and also mobile units	10% using lidar	100% using wind lidar	100% using wind lidar
300	**250**	**300**	**100**	**50**	**10**

Lidar units

Around 1,000 new lidar units sold **annually** for all applications, worldwide

The wind lidar fleet is growing



Modern wind farms need new methods

task 32 lidar

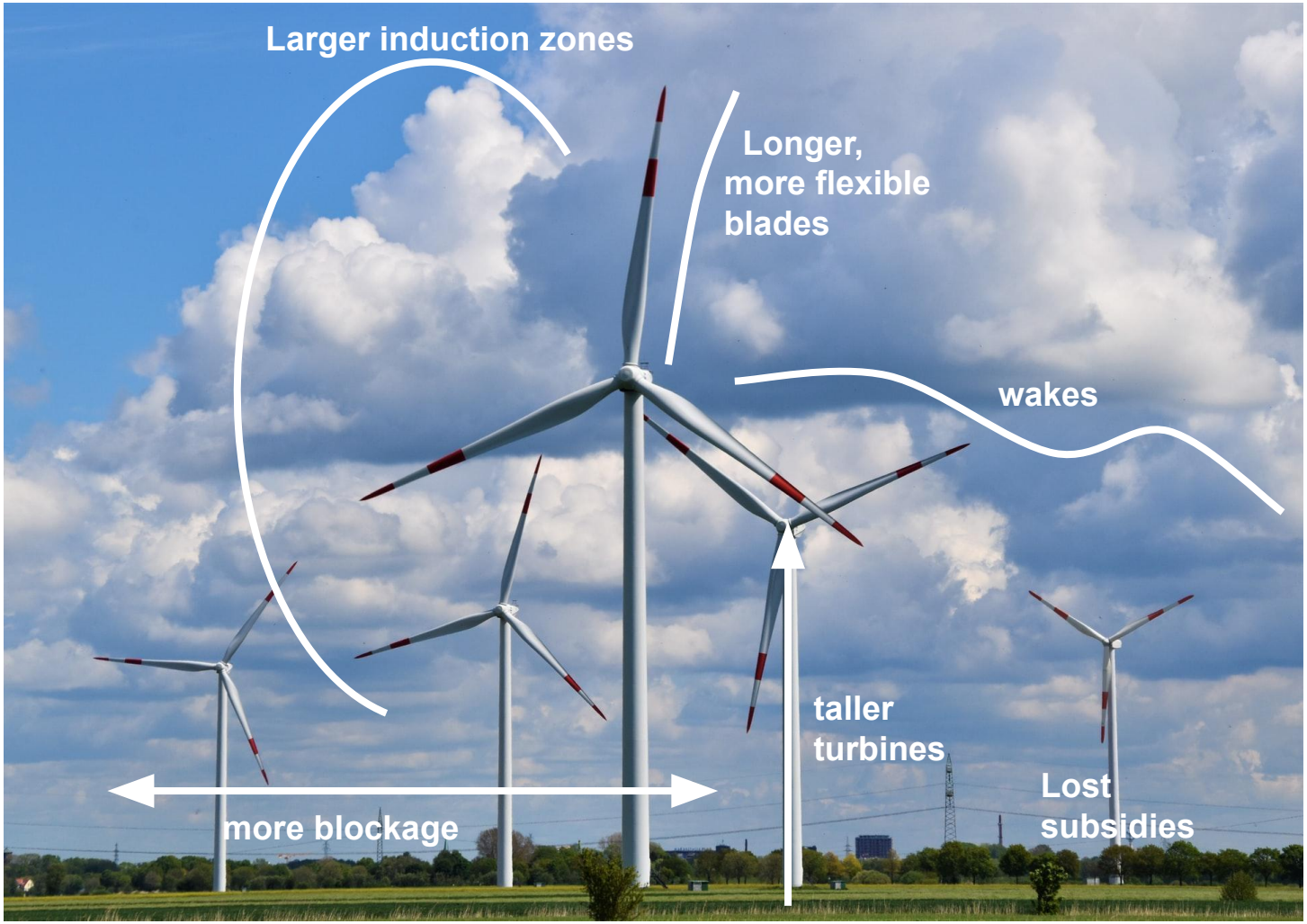


Photo by Waldemar Brandt on Unsplash

More lidar mean new questions

We need to build, install, and operate 5x as many lidar in 5 years time

- How do we transfer our expertise from met masts and anemometers, to lidars?
- How do we simplify lidar?
- How do we better use lidar?

Our current phase ends this year, but the need for a Task is still there. What should we be doing next?

The next phase: 2021-2025

How do we make the wind plants of tomorrow possible?

Photo by Nicholas Doherty on Unsplash

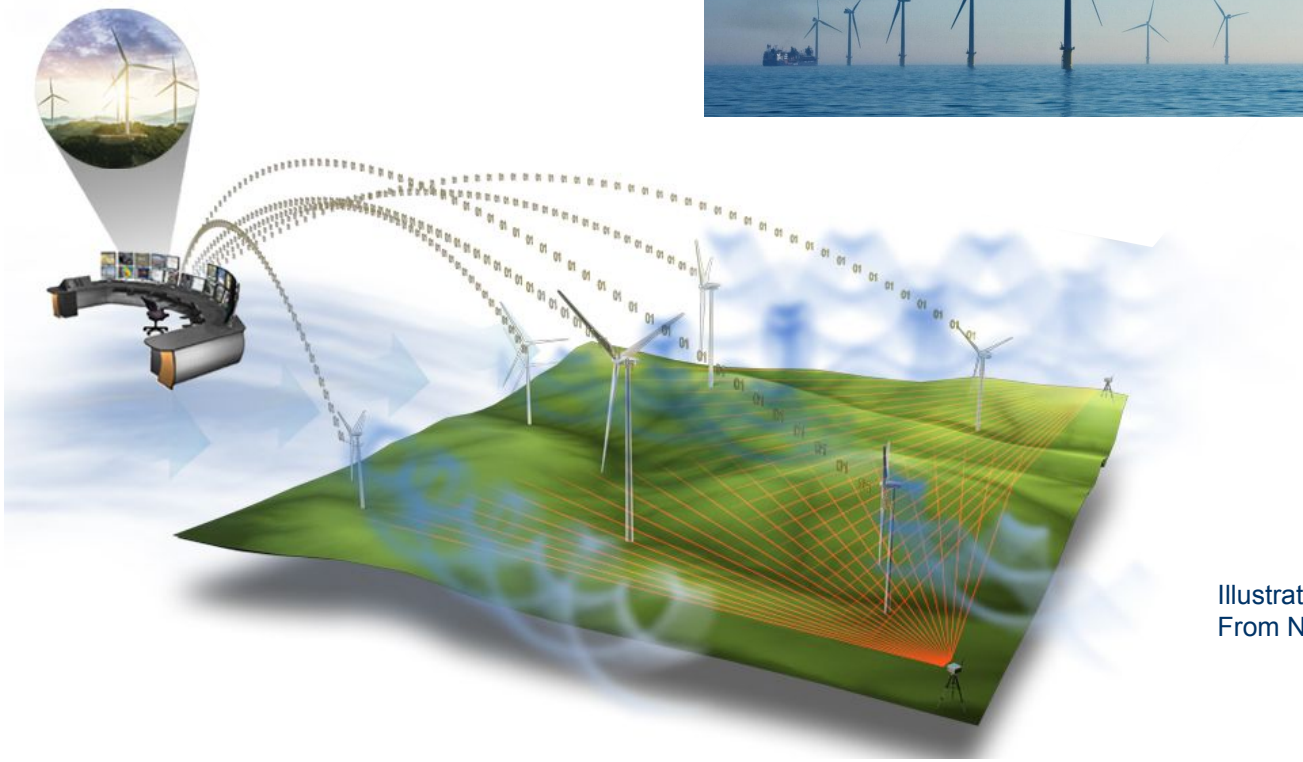


Illustration by Josh Bauer, NREL.
From NREL/TP-5000-68123 (2017)

Updating the Operating Agents

Dr. Andrew Clifton
University of Stuttgart

Prof. Dr. David Schlipf
University of Flensburg

Dr. Julia Gottschall
Fraunhofer IWES

A new Task 32 strategy

Mission
Task 32 members work together on research to make wind lidar the best and preferred wind measurement tool for wind energy applications.

Vision
Using wind lidar will be easy. It will bring advantages and opportunities that enable the deployment of wind energy.

Values
Innovation, inclusion, diversity, cooperation, and openness.

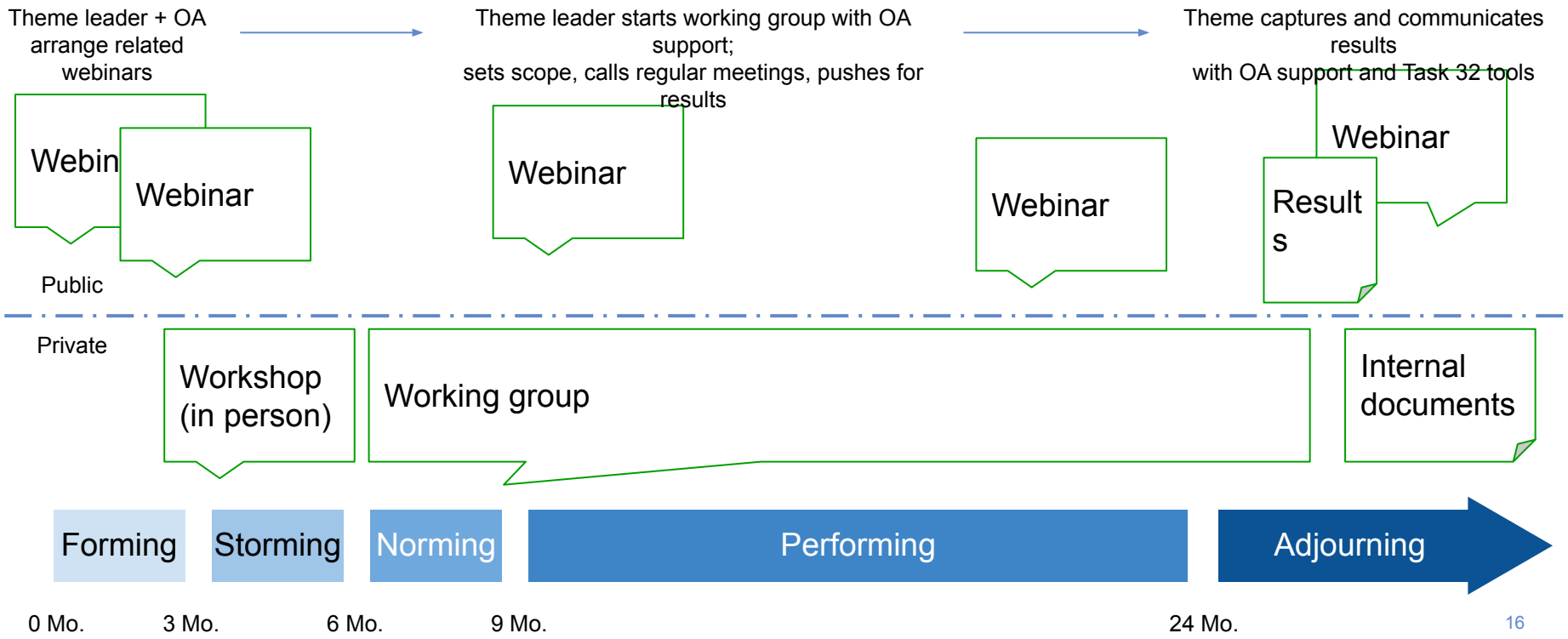
Goals & deliverables

	Theme	Mission	Deliverables
1.	**Universal inflow characterisation**	Working towards tools and methodologies to get and use the best information about inflow conditions to any wind turbine, anywhere.	
2.	**Replacing met masts**	Creating guidelines for the selection and use of different types of wind lidar and software for site assessment	
3.	**Connecting wind lidar**	Helping users to improve measurements and extract value from their lidar(s) and data by making lidar data FAIR. Enable them to connect to an ecosystem of service providers.	
4.	**Accelerating offshore wind deployment**	Promoting wind lidar as a key enabling technology throughout the offshore wind project lifecycle	

Goals & deliverables

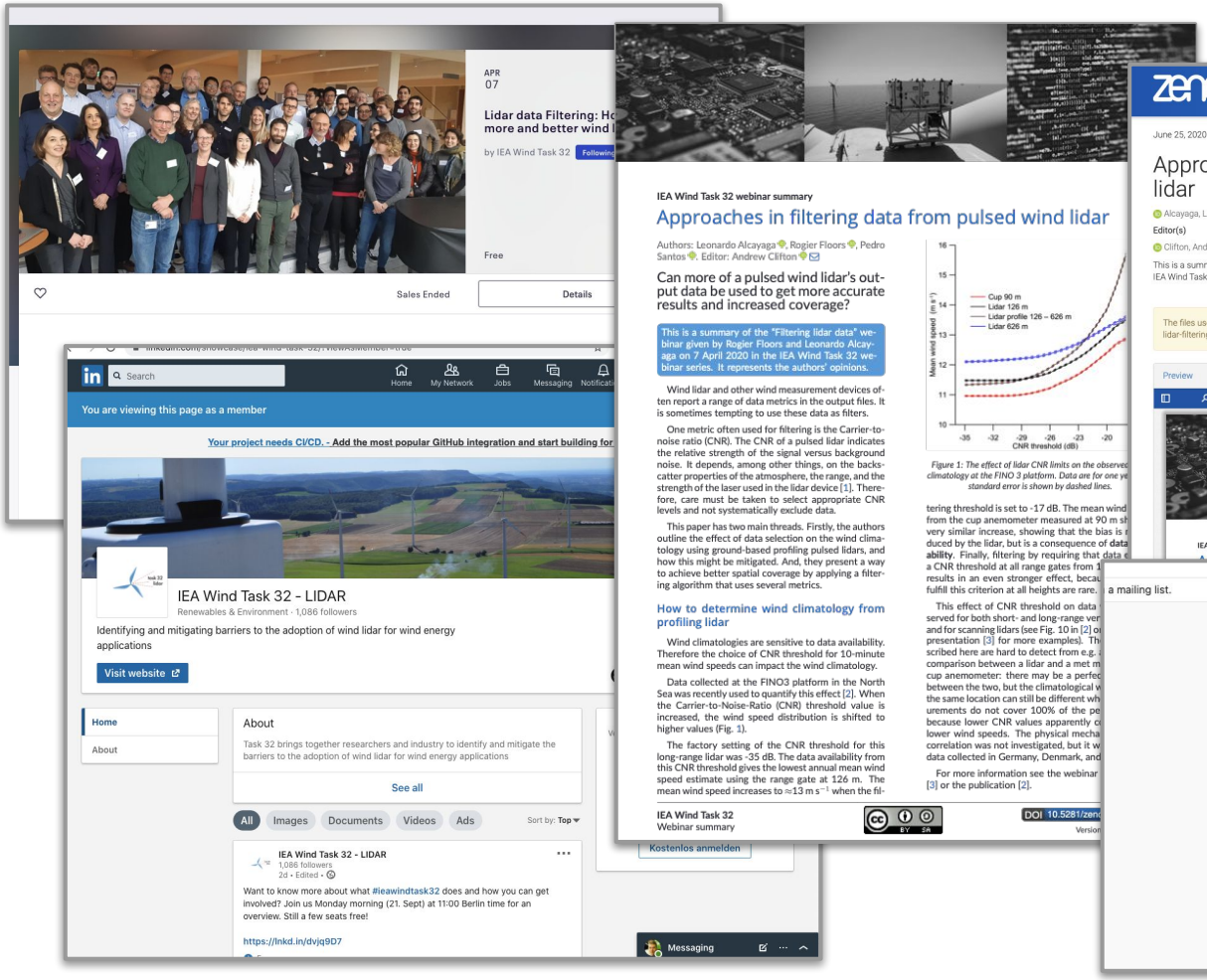
	Theme	Mission	Deliverables (ideas - TBC)
1.	**Universal inflow characterisation**	Working towards tools and methodologies to get and use the best information about inflow conditions to any wind turbine, anywhere.	1. RP for lidar-assisted controls 2. Expert Report addressing further applications (load verification, TI focus, ...)
2.	**Replacing met masts**	Creating guidelines for the selection and use of different types of wind lidar and software for site assessment	1. Share-X exercise with CFARS to compare results from different complex terrain correction methods
3.	**Connecting wind lidar**	Helping users to improve measurements and extract value from their lidar(s) and data by making lidar data FAIR. Enable them to connect to an ecosystem of service providers.	1. Extend the e-wind lidar common data format to work with Task 43's wind resource data model 2. OpenLidar modular wind lidar architecture and wind lidar ontology
4.	**Accelerating offshore wind deployment**	Promoting wind lidar as a key enabling technology throughout the offshore wind project lifecycle	1. RP for the application of scanning lidars 2. Continuation of work on floating lidars (?)

Task format


Theme leader + OA arrange related webinars
Theme leader starts working group with OA support;
sets scope, calls regular meetings, pushes for results
Theme captures and communicates results
with OA support and Task 32 tools
Webin
Webinar
Webinar
Webinar
Webinar
Result s
Public
Private
Workshop (in person)
Working group
Internal documents
Forming
Storming
Norming
Performing
Adjourning
0 Mo.
3 Mo.
6 Mo.
9 Mo.
24 Mo.

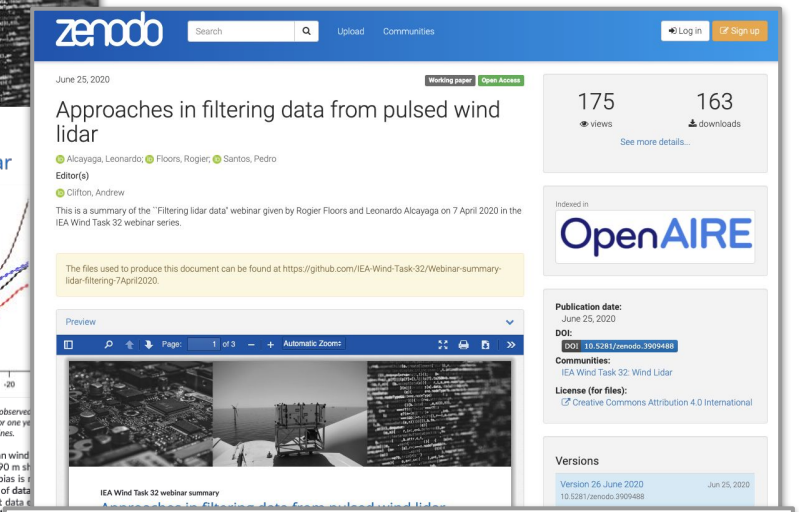
Task 32 has a powerful brand

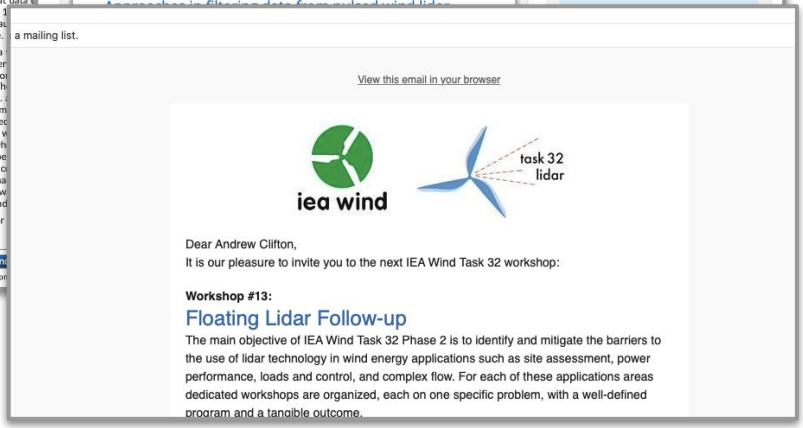
Regular events with 60 attendees



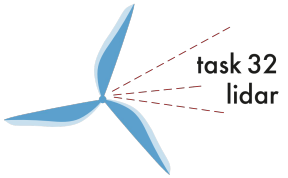
1200 followers on LinkedIn

30 publications in 2020 and 2021





500 people on our mailing list



We’d like your feedback on our ideas

Today’s agenda

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1: Universal Inflow Characterisation

An example of how the breakout rooms will work

Theme 1:
Universal Inflow Characterisation

How can we make the vision more attractive and relevant?

Mission
Working towards tools and methodologies to get and use the best information about inflow conditions to any wind turbine and any wind farm, using lidar and other sensors. We need to add more details in separate text.

What are meaningful and achievable deliverables? Why? How could we achieve them?

Deliverables
1. RP for lidar-assisted controls Why? Meaningful: LAC large market, increasing interest. Achievable: motivated participants. How? Form a working group and get started!
2. Working group/Workshop on inflow characterisation resulting in guidelines e.g. for TI measurement Why? Industry need and current research How? Organize a working group

Theme 1:
Universal inflow characterisation

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POTENTIAL PARTICIPANTS

Country /Organisation	Topic
.. / ..	…

RELATED RESEARCH AND OTHER ACTIVITIES

Country /Organisation	Topic
.. / ..	…

Choose your breakout rooms

1. Click **Breakout Rooms** in your meeting controls.
   This will display the list of open breakout rooms created by the host.
2. Hover your pointer over the number to the right of breakout room you wish to join, click **Join**, then confirm by clicking **Join**.
3. Repeat as necessary to join other breakout rooms, or click **Leave Room** to return to the main session.

Room	Theme
1.	Universal inflow characterisation
2.	Replacing met masts
3.	Connecting wind lidar
4.	Accelerating offshore wind deployment

2: Replacing met masts

Theme 2:
Replacing met masts

How can we make the vision more attractive and relevant?

Mission
Creating guidelines for the selection and use of different types of wind lidar and software for site assessment.

What are meaningful and achievable deliverables? Why? How could we achieve them?

Deliverables (ideas - TBC)
1. Share-X exercise with CFARS to compare results from different complex terrain correction methods Why? How?
Stand-alone use of lidar in highly complex terrain → benchmark of correction methods (cf. CFARS / alignment!) → develop standard (more statements / position / some agreement within industry)
Also focus on site suitability (tubulence?) + involve more turbine manufacturere

Theme 2:
Replacing met masts

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POTENTIAL PARTICIPANTS

Country /Organisation	Topic
.. / ..	…

RELATED RESEARCH AND OTHER ACTIVITIES

Country /Organisation	Topic
.. / ..	…

3: Connecting wind lidar

Theme 3:
Connecting wind lidar

How can we make the vision more attractive and relevant?

Mission
Helping users to improve measurements and extract value from their lidar(s) and data by making lidar data FAIR. Enable them to connect to an ecosystem of service providers.

What are meaningful and achievable deliverables? Why? How could we achieve them?

Deliverables (ideas - TBC)
1. Extend the e-wind lidar common data format to work with Task 43's wind resource data model Why? Ability to create flexible, modular, data processing workflows that combine best-in-class solutions from multiple vendors How? Demonstration Python / Jupyter notebook
2. OpenLidar modular wind lidar architecture Why? Ability to collaborate on lidar system design and operation How? Working group with results captured in SKOS / RDF format (WG already started 2021)
3. Wind Lidar ontology Why? Common vocabulary / glossary for all wind lidar users to reduce uncertainty and help newbies How? Working group with results captured in SKOS / RDF format (WG already started 2021)

Theme 3:
Connecting wind lidar

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POTENTIAL PARTICIPANTS

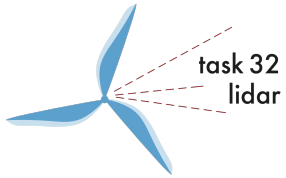
Country /Organisation	Topic
DE / USTUTT	Wind lidar ontology
EU / COST PROBE	Common data format

RELATED RESEARCH AND OTHER ACTIVITIES

Country /Organisation	Topic
DE / USTUTT	Wind lidar ontology (LIKE project)
IEA Wind Task 43	
CFARS	
EU / COST PROBE	Common data format / data processing

4: Accelerating offshore wind deployment

Theme 4:
Accelerating offshore wind deployment



How can we make the vision more attractive and relevant?

Mission
Promoting wind lidar as a key enabling technology throughout the offshore wind project lifecycle

What are meaningful and achievable deliverables? Why? How could we achieve them?

Deliverables (ideas - TBC)
1. RP for the application of scanning lidars Why? Important document, but broad How? Start with application-independent issues (pointing accuracy, mapping, Dual-Doppler, best-practices for setup, commissioning, monitoring,...)
2. Continuation of work on floating lidars Why? Motion compensation and TI parameter still a gap How? High frequency data from floating lidar systems
3. Nacelle lidars offshore Why? Space for improvements for nacelle lidars offshore (power performance, load verification, ...) How? Share experiences with

Theme 4:
Accelerating offshore wind deployment

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POTENTIAL PARTICIPANTS

Country /Organisation	Topic
.. / ..	…

RELATED RESEARCH AND OTHER ACTIVITIES

Country /Organisation	Topic
.. / ..	…
UK/OWA	**OWA connections with Task 32**
NO/UiB	**Motion correction topics + Train2Wind PhD project**

Next Steps

- Consolidate feedback from workshops in July and August
- Task 32 strategy update in August / September
- Task proposal to IEA Wind in October
- New phase starting in January 2021

Please complete our survey

Get in touch with Task 32

Dr. Andrew Clifton
University of Stuttgart

ieawind.task32@ifb.uni-stuttgart.de

Prof. Dr. David Schlipf
University of Flensburg

david.schlipf@hs-flensburg.de

Dr. Julia Gottschall
Fraunhofer IWES

julia.gottschall@iwes.Fraunhofer.de

our website - our data - our documents

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