Report 2023
Task 52

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Large-Scale Deployment of Wind Lidar

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Task 52 kicked off in May 2022 as the relaunch of its predecessor Task 32, which in the last ten years had successfully supported international collaboration on different wind lidar related topics and applications.

Task 52 builds on these achievements by leveraging the existing network and community to ensure wind lidar is continued to be used by the industry, hence supporting the deployment of onshore and offshore wind.

Task 52 participants collaborate on research with the goal of making wind lidar the superior and preferred wind measurement tool for wind energy applications. Its vision is to make wind lidar user-friendly in order to provide advantages that facilitate the deployment of wind energy. Four central themes have been identified, each with dedicated

deliverables planned for the four-year period of the Task:

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

Within these four themes, nine working groups have formed, each focusing on one technical deliverable and inviting all confirmed Task 52 members to contribute and participate. The aim is to support the overall the large-scale deployment of wind lidar, and to connect industry and academia to provide the most innovative solutions and application-oriented training for future experts.

Introduction

Over the last two decades, lidar has become the standard measurement technology in the wind industry and wind energy research. Initiated in 2012, Task 32 focused on the technology and its application throughout three phases. Initially, the Task was dedicated to the technology itself, but later switched to researching barriers hindering its use and application, and the mitigation of these barriers.
By the final phase of Task 32, measuring wind using lidar had largely been accepted in the wind industry. In many cases, lidar was proven to be a superior solution compared to measuring with traditional anemometers installed on meteorological masts.

However, as the lidar market has developed, new challenges have arisen. These include the ability to handle large volumes of lidar data, training a sufficient number of lidar experts, and the need for standardised methods for carrying out and using measurements. In light of these challenges, Task 52 pursues the mission of international research collaboration to make wind lidar the superior and preferred wind measurement tool for wind energy applications.

Table 1. Countries Participating in Task 52.

COUNTRY/SPONSOR	INSTITUTION(S)
Austria	Energiewerkstatt, EWS Consulting
Canada	Nergica, UL Renewables, DNV
China	Goldwind, Windey, KC Winden, Movelaser, Leice, CRRC, Envision, HEAG, Shanghai Jiao Tong University
Denmark	DTU, Metek Nordic, SGRE, Peak Wind, COP, Ørsted, Vestas
France	IFPEN, Vaisala, Lumibird, EDF, Total Energies, Akrocean, Epsiline
Germany	Fraunhofer IWES / IEE, FUAS, DNV, EnBW, SGRE, University of Stuttgart / SWE, DWG, Vattenfall, Enercon, OWC, sowento, Abacus Laser, GE, IAV, Ramboll, Leonardo, enerlace, UL International, University of Oldenburg / ForWind, DWD, Nordex, MUAS
Greece	2en
Japan	Mitsubishi Electric, AIST, Greenpower, Shimizu Corporation, JRE, Winc, MetroWeather
Korea	Webons, Kyungpook National University, Kier
The Netherlands	TNO, TU Delft
Spain	Enel
Switzerland	Meteotest, Meteo Swiss
United Kingdom	Oldbaum Services, Wind Farm Analytics, ZX Lidars, University of Edinburgh, Renewable Dynamics, Blue Ocean Consulting, Black and Veatch, SSE, Wool PLC
United States	NREL, Arcvera, PNNL, SGRE

Key objectives of Task 52:

1. Support large-scale deployment of wind lidar by addressing key themes and achieving relevant deliverables.

2. Integrate industry and academia in most innovative solutions and application-oriented training of young researchers.

3. Facilitate strong collaboration with other Tasks within the IEA Wind TCP to share knowledge and make use of the related synergies.

Progress and Achievements

The technical activities in Task 52 are organised into individual working groups, each initiated and responsible for one planned deliverable of the overall work plan. In 2023, there were a of total seven active working groups focusing on the following projects:

1. Lidar Turbulence Measurements and Lidar Assisted Control (both within the theme 'Universal inflow characterisation').

1. Lidar in Complex Terrain and Lidar Cold Climate (Theme: 'Replacing met masts').

2. Digitalisation and Lidar Ontology (Theme: 'Connecting wind lidar').

3. Scanning Lidar Offshore (Theme: 'Accelerating offshore wind deployment').

The initiation of two additional working groups, namely 'Nacelle Mounted Lidar in Complex Terrain' and 'Floating Lidar', is planned for 2024. Progress has been made in all active working groups. However, most deliverables are scheduled for the second half of the Task's current phase.

In parallel with the working groups, a lunch seminar series was organised for the first time in 2023. Over four consecutive days, an online seminar was held at lunchtime (CET), highlighting four different focus topics of Task 52. Speakers were drawn from both academia and industry to ensure both perspectives were represented. With a total of 210 participants, the format was so successful that it will be repeated in the following years of Task 52. The presentations have also been shared in the Task 52 community on Zenodo [1].

Furthermore, IEA Wind Task 52 was present at the Wind Energy Science Conference (WESC) 2023, organised by the European Academy of Wind Energy (EAWE). In two mini-symposia proposed by the Task Managers, topics relevant to Task 52 were presented and discussed [2]. Although WESC has traditionally been aimed at academia, the two sessions were also well attended by industry representatives, both as speakers and audience members.

Similarly, the General Meeting of Task 52 in 2023 was held as a 2-day online event, attended by a total of 108 participants discussing Task 52 themes and topics in various sessions and formats [3]. A presentation by wind farm developer and operator, Ørsted,

Figure 1: Proceedings of IEA Wind Task 52 Lunch Seminar Series 2023 on Zenodo (https://zenodo.org/records/7683412).

which compared six commercially available lidar systems, attracted particular attention. In the subsequent session, all lidar OEMs had the opportunity to comment on the results and discuss them further. This overview demonstrated that the wind lidar industry is not only continuing to develop, but is also becoming broader and more diverse. This development underscores the need for recommended practices and guidelines that are not only tailored to one specific type of technology, which will support the large-scale deployment of wind lidar.

Highlight(s)

- A WG6 meeting on Scanning Lidar (mainly for offshore appli-

cations) was hosted by JEMA in Tokyo, Japan, in May 2023. The meeting was specifically intended to bring together Japanese and European scanning lidar experts and to foster a discussion between the WG and the IEC 61400-50-5 project team, aiming to publish an IEC technical specification for that technology. The latter was kicked off later in 2023 and is led by the Japanese expert Professor Yamaguchi. A close cooperation between the two expert groups is considered crucial for both initiatives.

- As part of the Task 52 General Meeting in June 2023, the 15 early-stage researchers of the MSCA ITN LIKE ('Lidar Knowledge Europe') project presented their

work in a 'students' session'. As the training of young researchers is one of the key objectives of Task 52, the involvement of LIKE has been a focus of the Task from the beginning. LIKE was successfully completed in 2023.

- Another highlight of the General Meeting was a joint discussion with representatives from two other IEA Wind Tasks. Particularly, the collaboration with Task 43, on Digitalisation, is planned to be further promoted with obvious links via the Task 43 data model. This was developed for testing (floating) lidar data, and the lidar ontology, which was developed in Task 52 but has been discussed with Task 43 experts.

Figure 2: Meeting of Task 52 working group on Scanning Lidar Offshore in Tokyo (hosted by JEMA) in May 2023.

Outcomes and Significance

In addition to discussing and documenting progress on the state-of-the-art for its focus topics, Task 52 has set the goal of explicitly promoting standardisation in two areas. The development and publication of the 'Expert Report on Recommended Practices' (RP) has been planned for the two topics: 'Lidar Assisted Control' and 'Scanning Lidar Off-

shore', which are scheduled to be published within this phase of Task 52, which ends mid-2026. Both RPs are expected to be highly relevant to their respective sectors of the industry, with other technical deliverables also anticipated to yield significant outcomes. In addition, Task 52 provides a joint platform for academia and industry, which provides access to industry use cases for academia (including relevant data) and pro-

viding industry access to academic innovations.

Next Steps

Among other scheduled activities, Task 52 plans to host the second edition of the 'Lunch Seminar Series' and an in-person meeting in Berlin, Germany, in May 2024. Both events were explicitly requested by Task

Figure 3: Scanning lidar installation – one device of a pair in a dual setup – at nearshore site. *Photo credit: Fraunhofer IWES.*

52 participants. Furthermore, the initiation of two additional working groups on 'Nacelle Mounted Lidar in Complex Terrain' and 'Floating Lidar', respectively, are scheduled to be kicked off in 2024..

References

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[2] Glabeke, G., Thiébaut, M., Cano, L., Kidambi, A., Young, M., & Chen, Y. (2023). WESC 2023 Mini-Symposium 1.5 "IEA Wind Task 52: Replacing met masts and Accelerating offshore wind deployment". European Acade-my of Wind Energy.
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