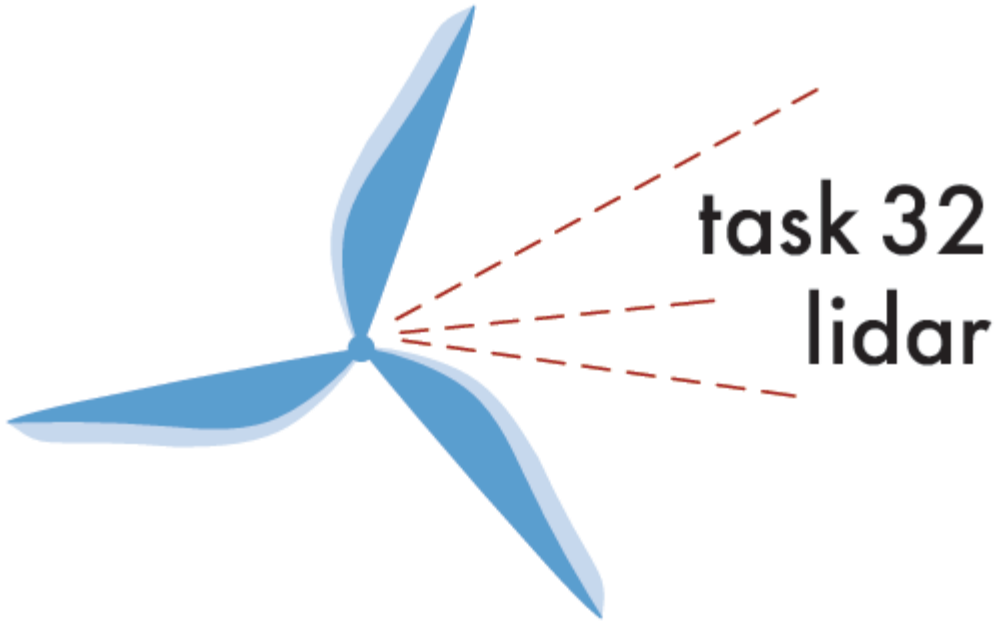
IEA Wind Task 32



David Schlipf
Operating Agent
SWE – University of Stuttgart
Germany

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International Energy Agency Wind agreement

- … is a vehicle for **member countries**
- to **exchange information** on the planning and execution of national large-scale wind system projects and
- **to undertake co-operative R&D projects** called Tasks.

IEA Wind Task 32

- Initiated 2011 by
  - ForWind – Oldenburg,
  - Danish Technical University (DTU) Wind Energy, and
  - Stuttgart Wind Energy (SWE) at the University of Stuttgart
- Phase 1 from 2012-2015
- Phase 2 from 2016-2018

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Goals from Phase 1

1. Provide an **international open platform** for regular and continuous **exchange of experience and progress**

2. Continue the development of **“IEA Recommended Practices”**

3. Identify areas for **further research** and development as well as **standardization** needs

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Results from Phase 1

1. Review and assistance in the publication of:
   IEA Wind Recommended Practices 15 on Ground-Based Remote Sensing
   => 3,200 downloads during the first 2 years

2. IEA Expert Report: *Estimating Turbulence Statistics and Parameters from Ground- and Nacelle-Based Lidar Measurements*

3. IEA State-of-the-art Report: *Recommended Practices for Floating Lidar Systems* (to be voted at ExCo#77 in May 2016)

4. IEA Technical Report: *Remote Sensing of Complex Flows by Doppler Wind Lidar: Issues and Preliminary Recommendations*

5. Rotor equivalent wind speed for power curve measurement – comparative exercise for IEA Wind Annex 32 (conference paper, 2014)

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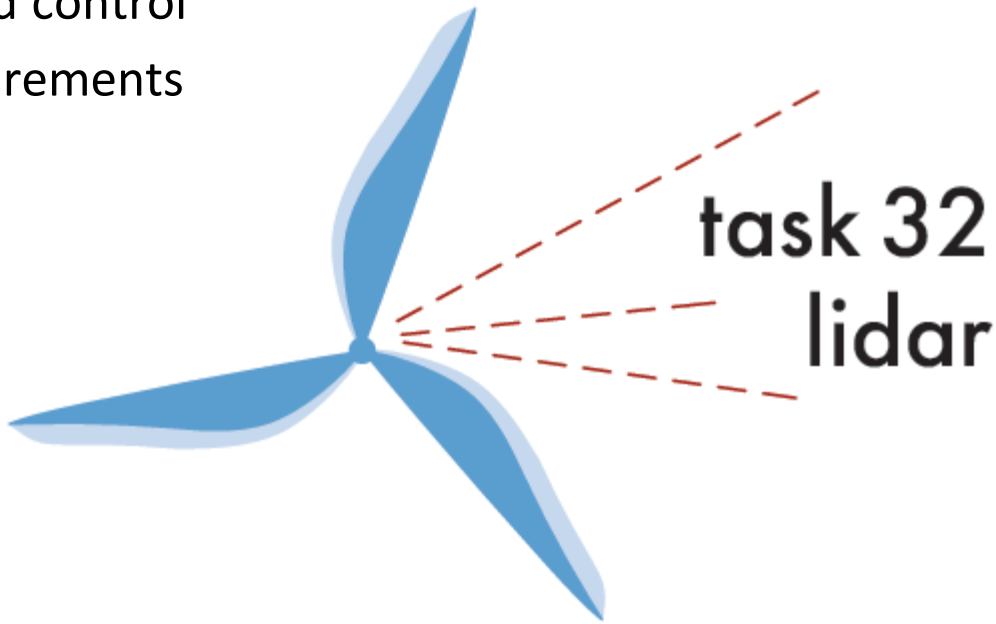
Motivation for Phase 2

- Expressed interest from participants to continue
- New institutions and countries plan to join an extension
- Work is not done: Lidar is becoming mature, but several barriers still exists!
- Specific interest in new topics not addressed before
  - lidar-assisted control
  - wake measurements



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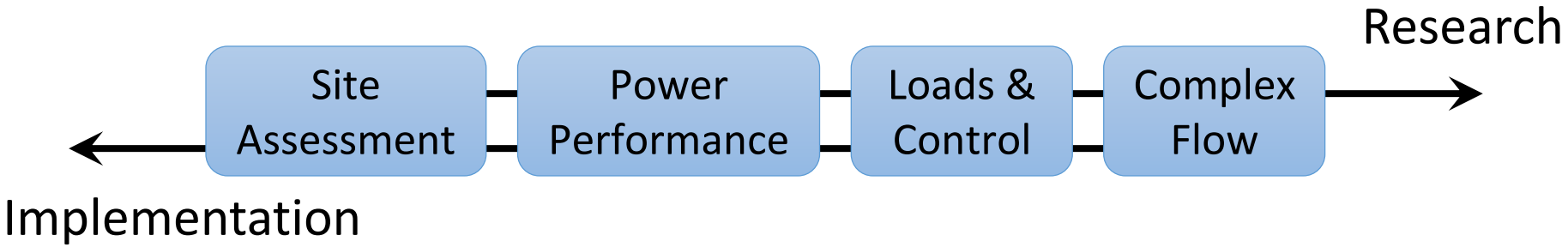
Main objective

Identify and mitigate barriers to the use of lidar for

- Site Assessment
- Power Performance
- Loads and Control
- Complex Flow



Expected results

- Yearly **workshops** for each application will be organized
  - focusing on one specific problem with well-define program
  - tangible outcome: paper, Expert Report, working group ...
- Yearly **general meetings** for international exchange of knowledge, experience, and ideas.
- Quarterly **newsletter** to serve the community.
- Revision of two **IEA Recommended Practices**:
  - RP on floating lidar
  - RP on ground-based remote sensing for wind resource assessment

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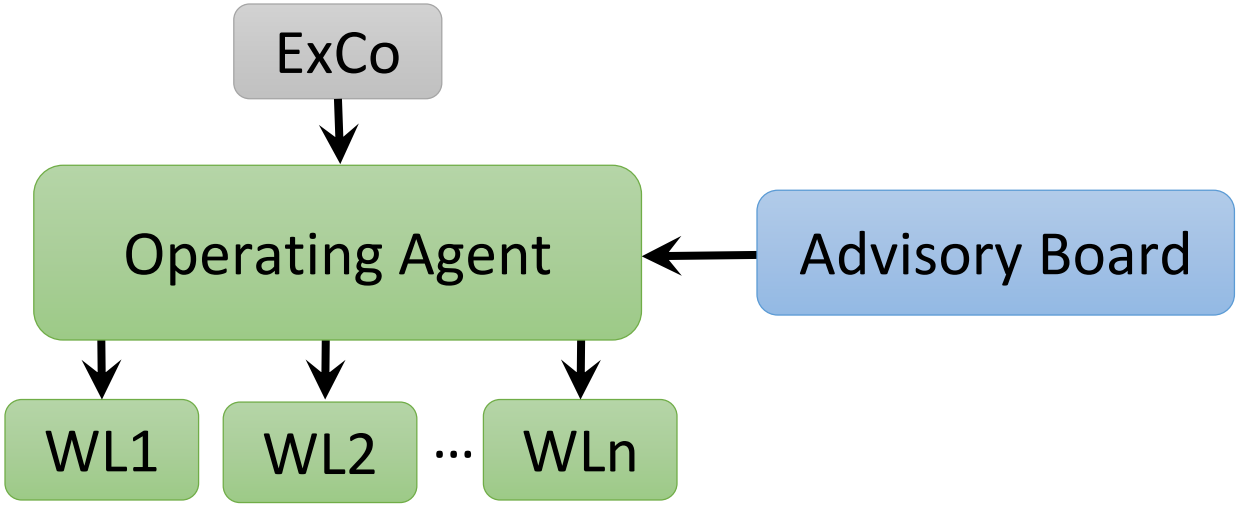
Management structure



- **Operating Agent (OA)**: executive body on IEA task level, connection to the ExCo
- **Workshop Leaders (WL)**: executive body on workshop level
- **Advisory Board (AB)**: supportive body for decision making

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Advisory board

Name	Institution	Focus Application
Julia Gottschall	Fraunhofer, DE	Site Assessment
Andrew Clifton	NREL, US	Site Assessment
Nicolai Nygaard	DONG Energy, DK	Site Assessment
Detlef Stein/Luke Simmons	DNV GL, DE	Site Assessment/Power Performance
Rozenn Wagner	DTU, DK	Power Performance
Ioannis Antoniou	Siemens, DK	Power Performance
Eric Simley	Envision, US	Loads and Control
Dhiraj Arora	GE, US	Loads and Control
Davide Trabucchi	ForWind, DE	Complex Flow
Peter Clive	SgurrEnergy, UK	Complex Flow

Regular meetings or telephone conference of experts to advice on workshops and general meeting

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Meeting strategy

- **General meeting**: Yearly meeting of all participants
- **Workshops**: Topical meetings of group of experts
  - 1 to 2 day workshops for each application each year
  - organized and hosted by a Workshop Leader + OA
  - if possible, scheduled around conferences or attached to meetings from relevant working groups such as IEA Tasks, IEC, etc.
  - will have some tangible outcome: workshop reports, webinars or a suggestion of a working group, etc.

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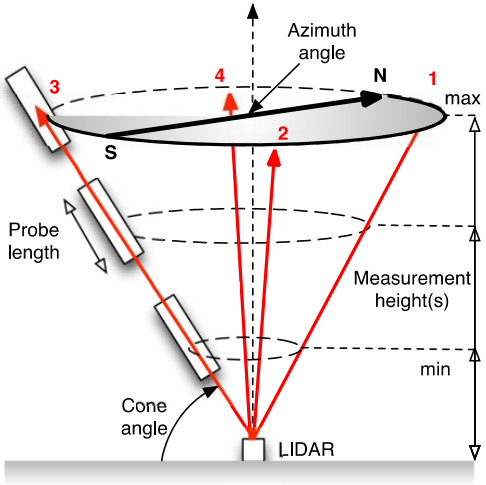
Application 1: Site assessment



- Floating Lidar Systems: Current Technology Status and Requirements for Improved Maturity (February 2016)
- Revise the Recommended Practices for ground-based remote sensing and the Recommended Practices for floating lidar systems

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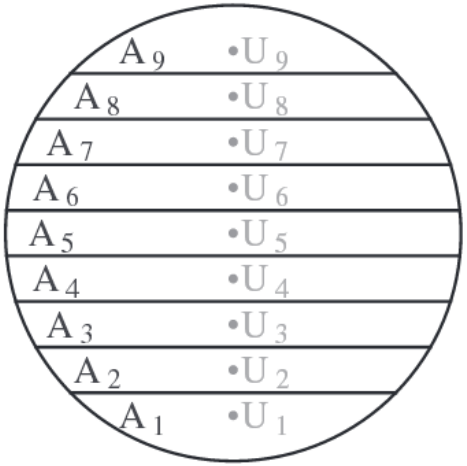
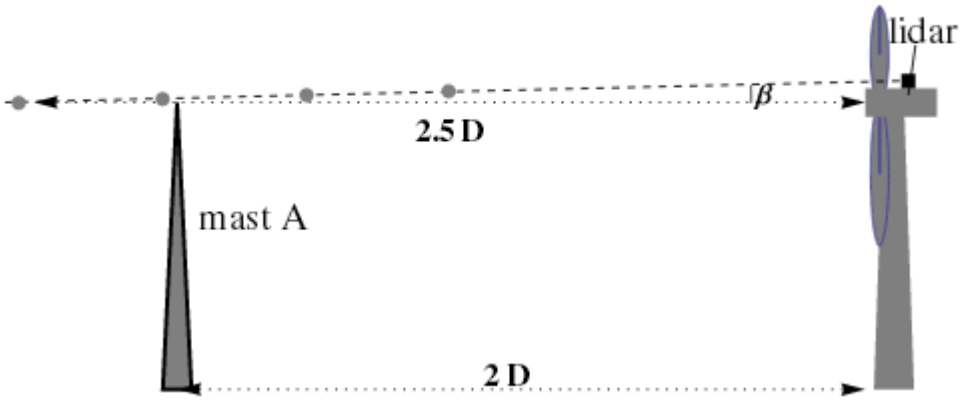
Application 2: Power performance

[Wagner et al.]





- Understand the uncertainties in lidar-based power curves (December 2016)
- Explore if and how new standards for the use of ground-based systems need to be adapted for the use of nacelle or spinner-based or floating systems
- Identify gaps in standards and transferability

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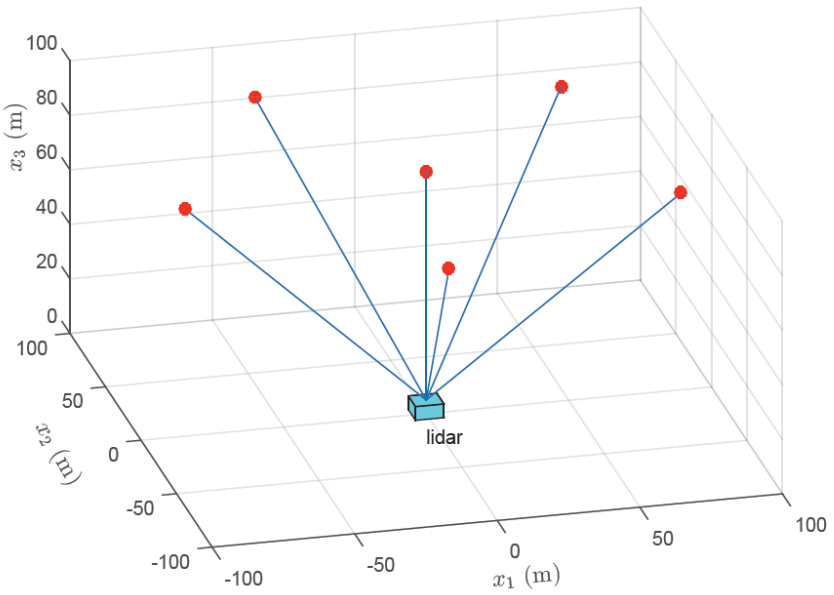
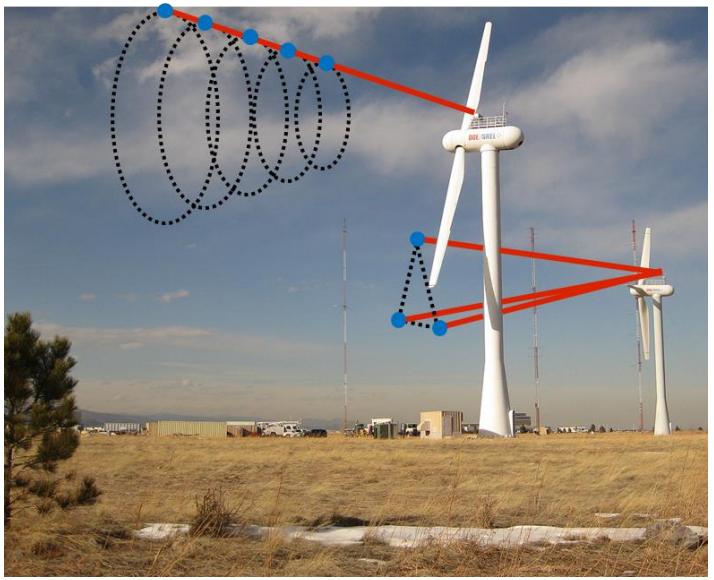
Application 3: Loads and control

[Sathe et al. Expert Report on Turbulence]





- Optimizing lidars for wind turbine control applications (July 2016)
- Initiate guidelines on how to use lidar in the load verification process.
- Explore the benefits of lidar-assisted control for the cost of wind energy.
  - ➢ Connection to IEA Wind Task 37 (System Engineering)

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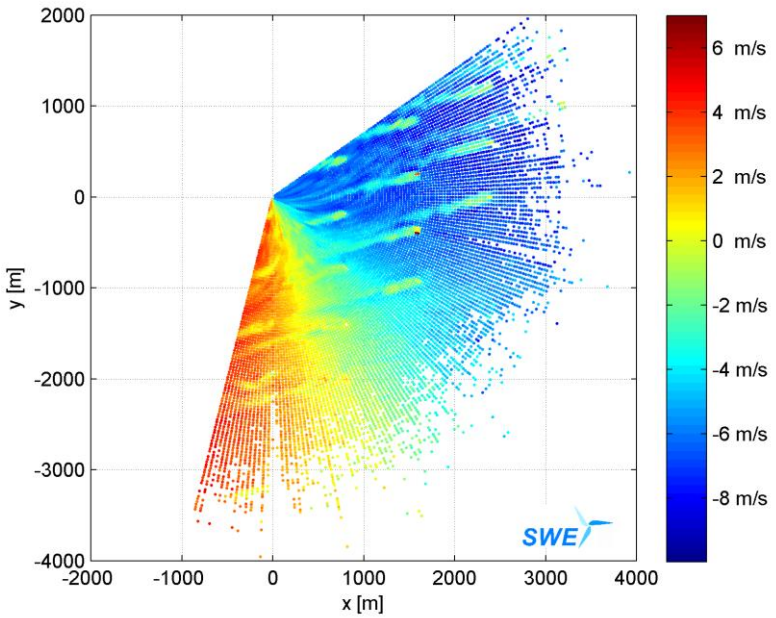
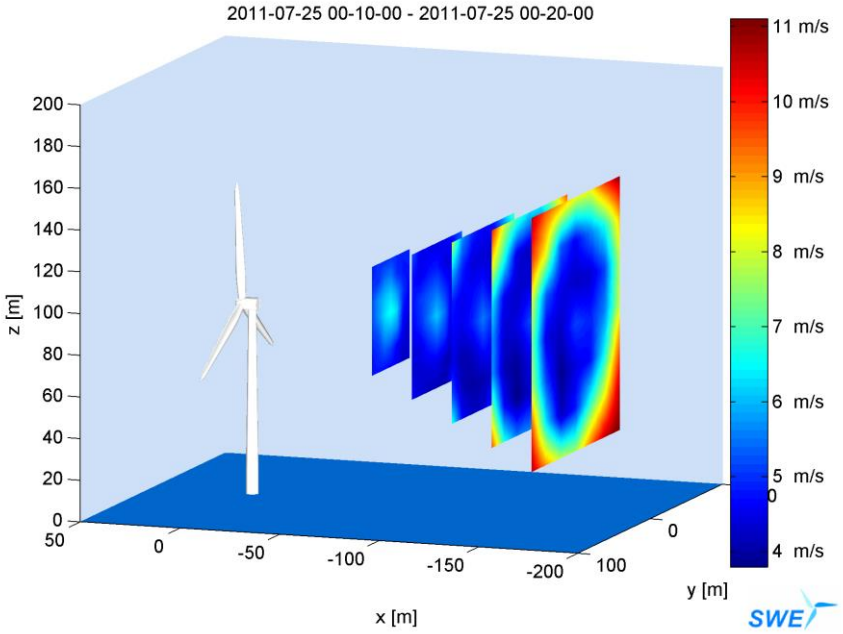
Application 4: Complex flow





- Understand the needs of measurements of complex flow, describe the limitations of lidar systems, provide recommendations for adjustments.
- Find metrics to compare flow simulations and lidar field measurements.
  - ➢ Connection to IEA Wind Task 31 (Wakebench) (October 2016)

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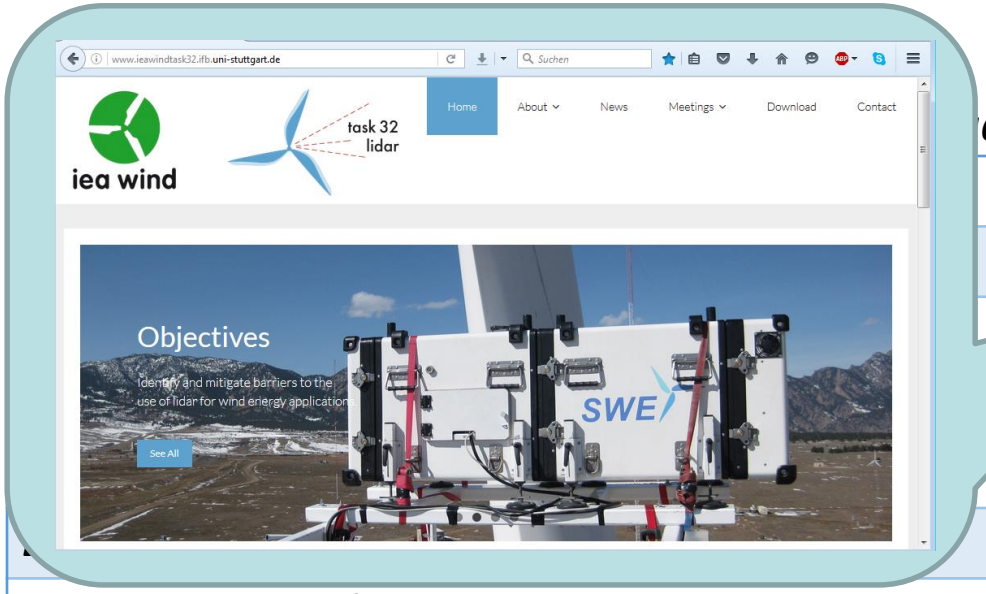
Timeline, milestones and deliverables



year	2016				2017				2018			
arter	1	2	3	4	1	2	3	4	1	2	3	4
	M											
		M										
				M				M				M
		W										
				A								
				D								
D4, D5, D6 Newsletter			D				D				D	
D7 Revised recommended practices floating lidar					D							
D8 Revised recommended practices ground-based RS									D			

Glasgow
Dec. 2016

milestones (M), workshops (W), Advisory Board (A), deliverables (D)

#1: Floating Lidar (Feb.)
#2: System optimization for control (July)
#3: Wake measurements (Oct.)
#4: Uncertainties in PC (Dec.)

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Participants

Country	Commitment
Austria	Committed (2016)
Belgium	Interested
Canada	Committed (2013)
China	Committed (2014)
Denmark	Committed (2012)
France	Committed (2015)
Germany	Committed (2012)
Israel	Interested
Japan	Committed (2012)
Korea	Interested
The Netherlands	Committed (2014)
Norway	Committed (2013)
Spain	Interested
Sweden	Interested
Switzerland	Interested
United Kingdom	Committed (2014)
United States	Committed (2012)

- From Phase 1:
  - 9 countries
  - 51 institutes
  - 127 experts
- Currently in Phase 2:
  - 11 countries
  - 67 experts at
    - 2 workshops and
    - 8 AB meetings

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Thank you!

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task 32
lidar

For further details please visit

www.ieawindtask32.org

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