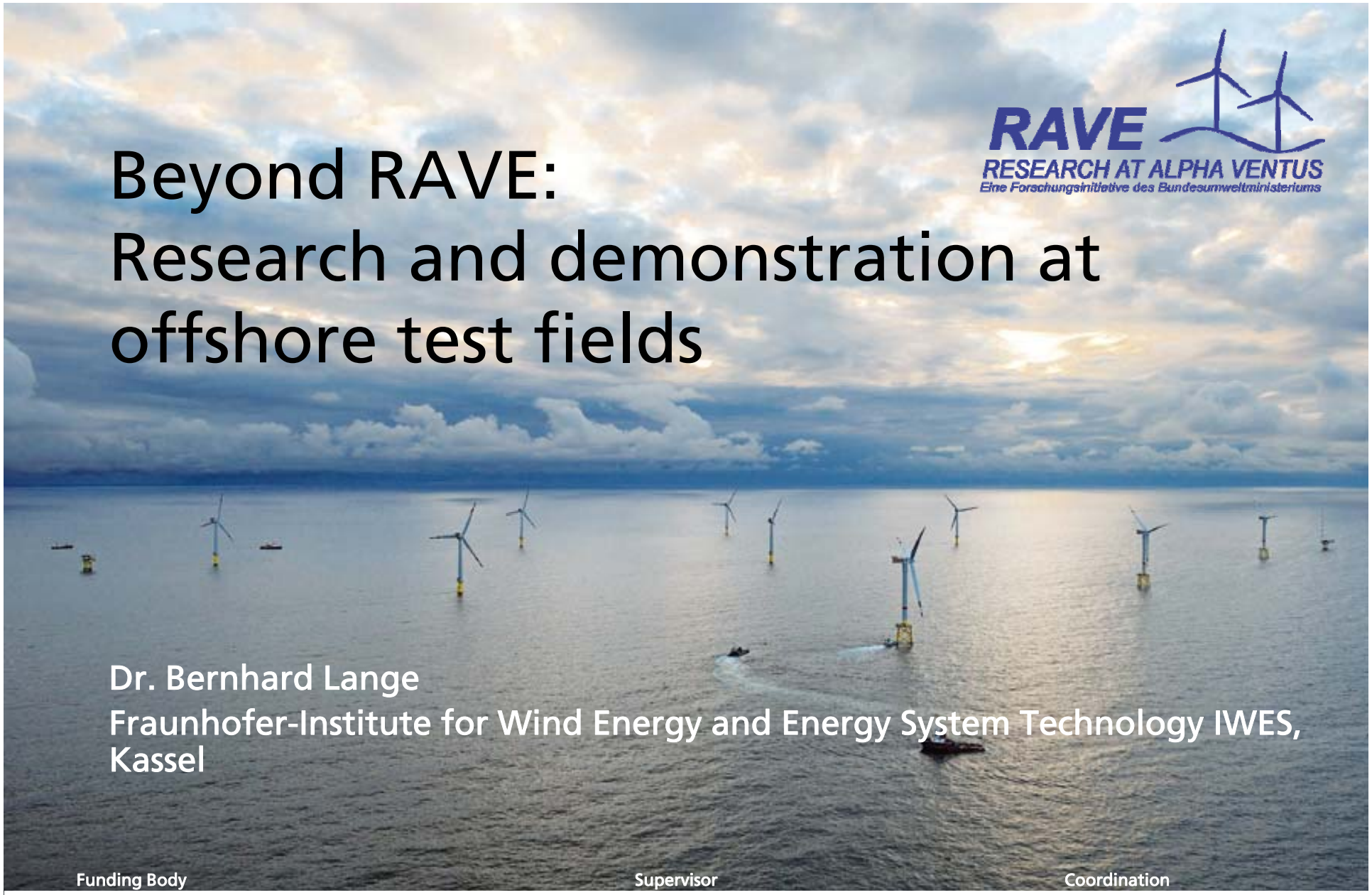

Beyond RAVE: Research and demonstration at offshore test fields

RAVE
RESEARCH AT ALPHA VENTUS
Eine Forschungsinitiative des Bundesumweltministeriums

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Coordination

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IWES

Why RD&D at offshore sites?

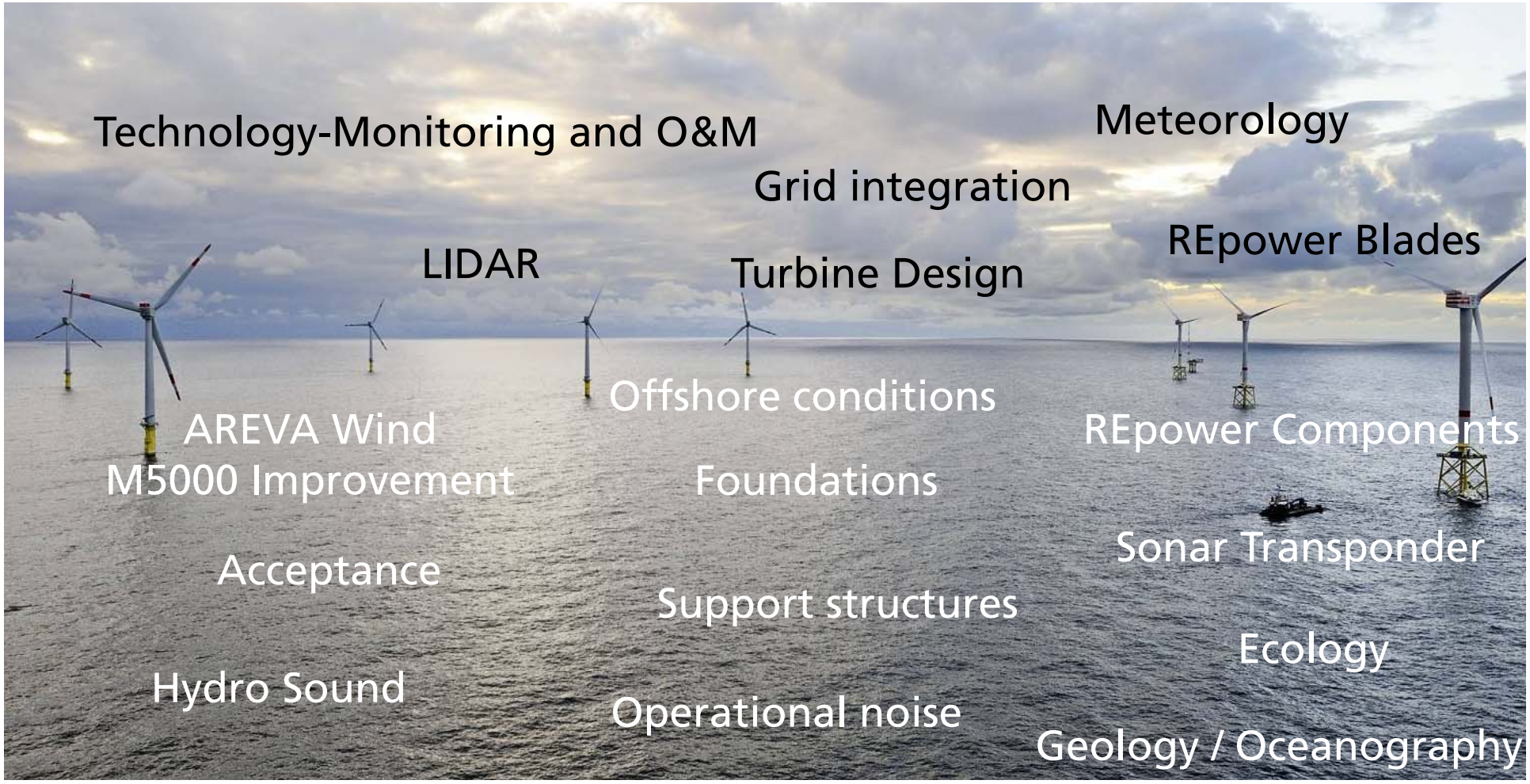
- RD&D needs data and experience from real offshore applications
  - Research needs data from real turbines in real conditions
  - Development needs the possibility to measure at new solutions
  - Demonstration for the market, which requires proven technology

- RD&D offshore is a necesssity

What is RAVE today?

- A research lab in the middle of the North Sea
- A huge unique set of measuremnet data
- A research community dedicated to offshore wind power
- A large number of research results
- A knowledge base in a broad range of topics in offshore wind power

RAVE Research Projects



Beyond RAVE

- RAVE
- New test fields
- Technology monitoring

RAVE

RAVE will continue, but the focus will shift in two ways:

- from design and erection to operation and maintenance
- from demonstration to research

Test field research beyond RAVE

Why?

- Possibility to continuously demonstrate the latest technology
- Possibility to ensure a continous technological development
- Possibility to test new, innovative concepts
- Possibility to geather research data from different technologies, different site conditions

Idea: Distributed Test Field

Instead of a second dedicated test field, offshore RD&D should be an integrated part of commercial offshore wind farms

Distributed over several sites and over time

Each part of the ‚distributed test field' should be

- Dedicated to specific RD&D goals
- Associated to a commercial wind farm
- Conducted by industry, research and wind farm owner together

Coordination within and between the test fields is essential

Example under planning: Albatros 1

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Planned offshore test field Albatros 1

- Part of the wind farm Albatros
- 110 sm to port, 40m water depth
- Demonstrate and test 10 gravity foundations
- Research in environmental, technical and logistics topics
- Industry, wind farm owner and researchers work together

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Technology Monitoring

A clear understanding of the status and issues of the technology is needed for each wind farm and on a general level

Collection of information and data across the industry

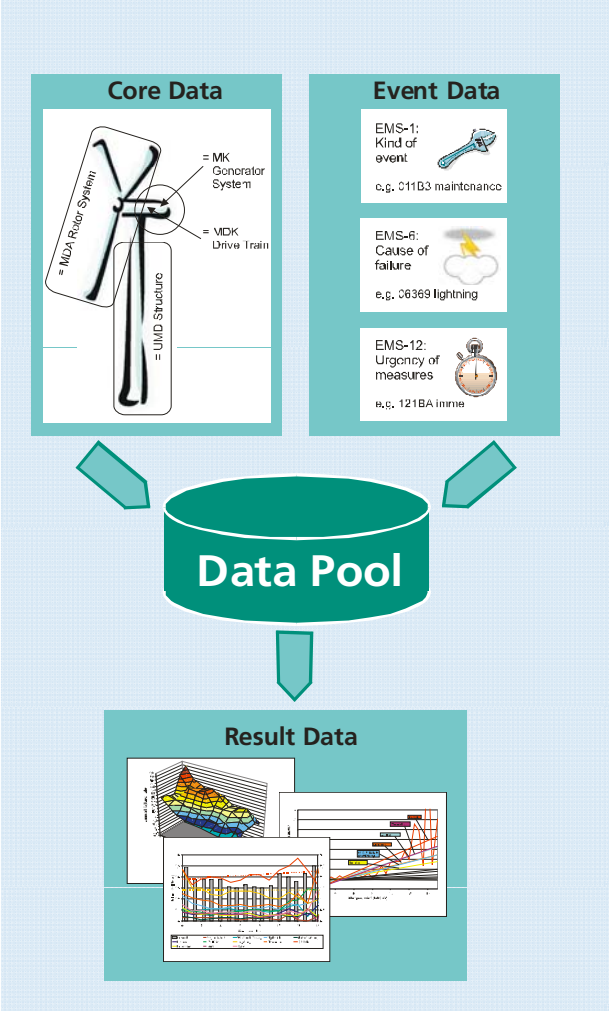
- To optimize maintenance and availability of specific wind farms

  → Systematical collection and evaluation of operational experiences

- To answer fundamental questions on development of wind power offshore

  → General monitoring

So far six wind farm operators confirmed participation



Summary

RD&D at offshore wind farms is very expensive, but necessary

- To demonstrate new technology
- To speed up the development and reduce risks
- To enable research relevant for the industry

Future RD&D offshore

- Continuation of RAVE
- RD&D offshore in a distributed test field
- Technology monitoring across the industry

Vision

International collaboration

- Test field research distributed over Europe with RD&D opportunities for industry and researchers
- European reseach community as knowledge base and partner for a European industry

Research and industry

- Close collaboration between industry and research community
- Innovative research with collaboration across companies

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Thank you for your attention!

More information: WWW.RAVE-OFFSHORE.DE