DTU Wind Energy in profile

2021

Contents

Cover: Camilla Nyborg is working on a PhD project which she hopes will result in a new method for wind farms to reduce the noise from the large blades and optimize energy yields. She is standing on the blades from Vindeby - the world's first offshore wind farm – currently stored at DTU Campus Risø. (Photo: Bax Lindhart)

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Creative direction: Simon Rubin

Technology for people

DTU Wind Energy is about taking the technology to the next level. About creating an impact for people and society through research and innovation. About collaborating with the entire wind energy sector to develop the most effective technology on the planet.

Photo Jørgen True

Research

Our research spans the full spectrum of wind energy systems. From the investigation of nanoscale structures in turbine components up to the macro-scale of atmospheric flow; from designing the turbines of the future to more democratic renewable project planning.

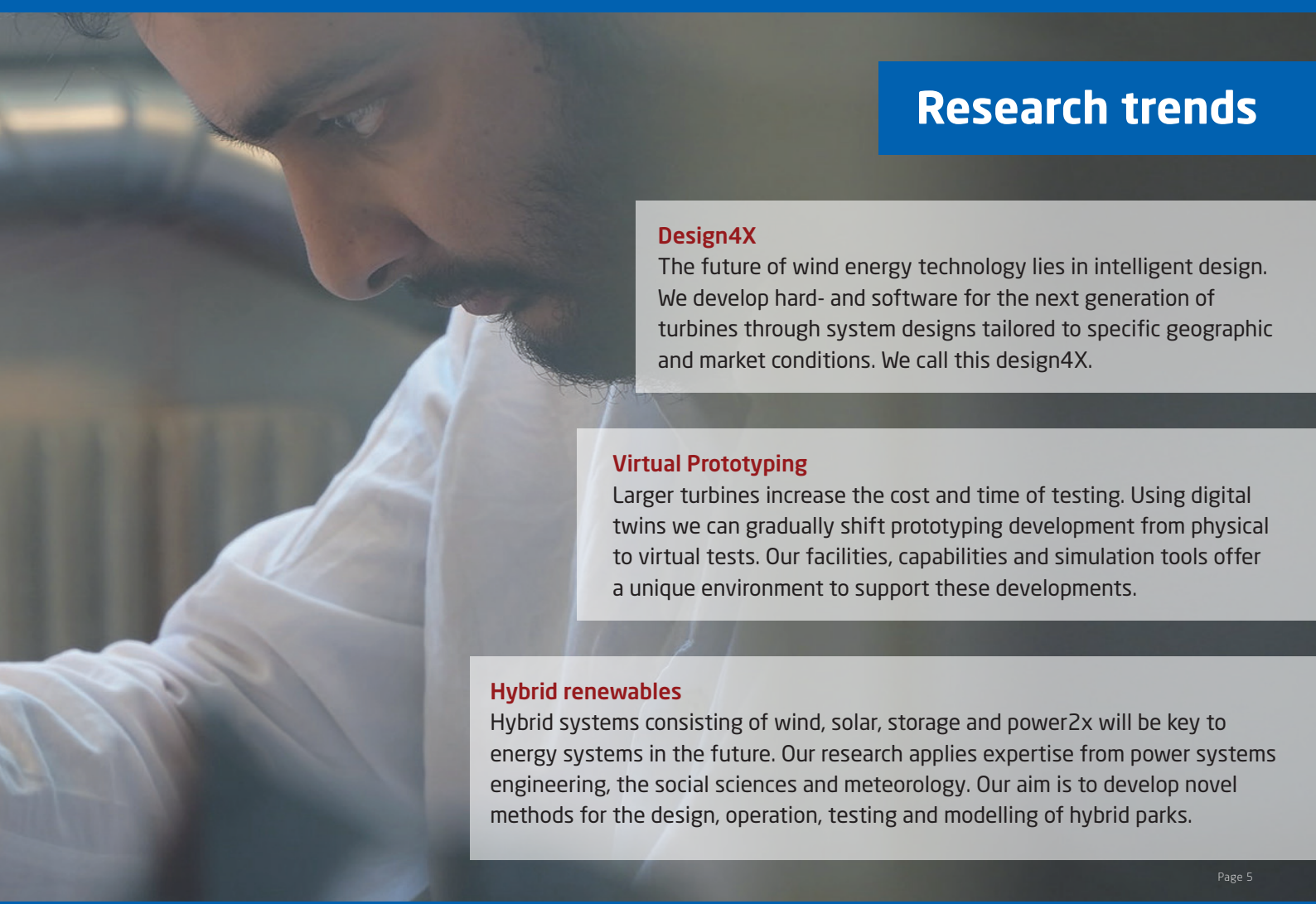
Developments in wind energy research are guided by three metrics:

- Reducing the cost of wind power
- New designs and system optimisation to increase the value of wind power
- Improved environmental and social sustainability

We engage in ongoing collaborations with companies and research organisations. This enhances our understanding of the technology challenges ahead and inspires new solutions.

Large or small, there is a piece of DTU Wind Energy in every wind turbine in the world.

Photo Simon Rubin



Research trends

Design4X

The future of wind energy technology lies in intelligent design. We develop hard- and software for the next generation of turbines through system designs tailored to specific geographic and market conditions. We call this design4X.

Virtual Prototyping

Larger turbines increase the cost and time of testing. Using digital twins we can gradually shift prototyping development from physical to virtual tests. Our facilities, capabilities and simulation tools offer a unique environment to support these developments.

Hybrid renewables

Hybrid systems consisting of wind, solar, storage and power2x will be key to energy systems in the future. Our research applies expertise from power systems engineering, the social sciences and meteorology. Our aim is to develop novel methods for the design, operation, testing and modelling of hybrid parks.

Education

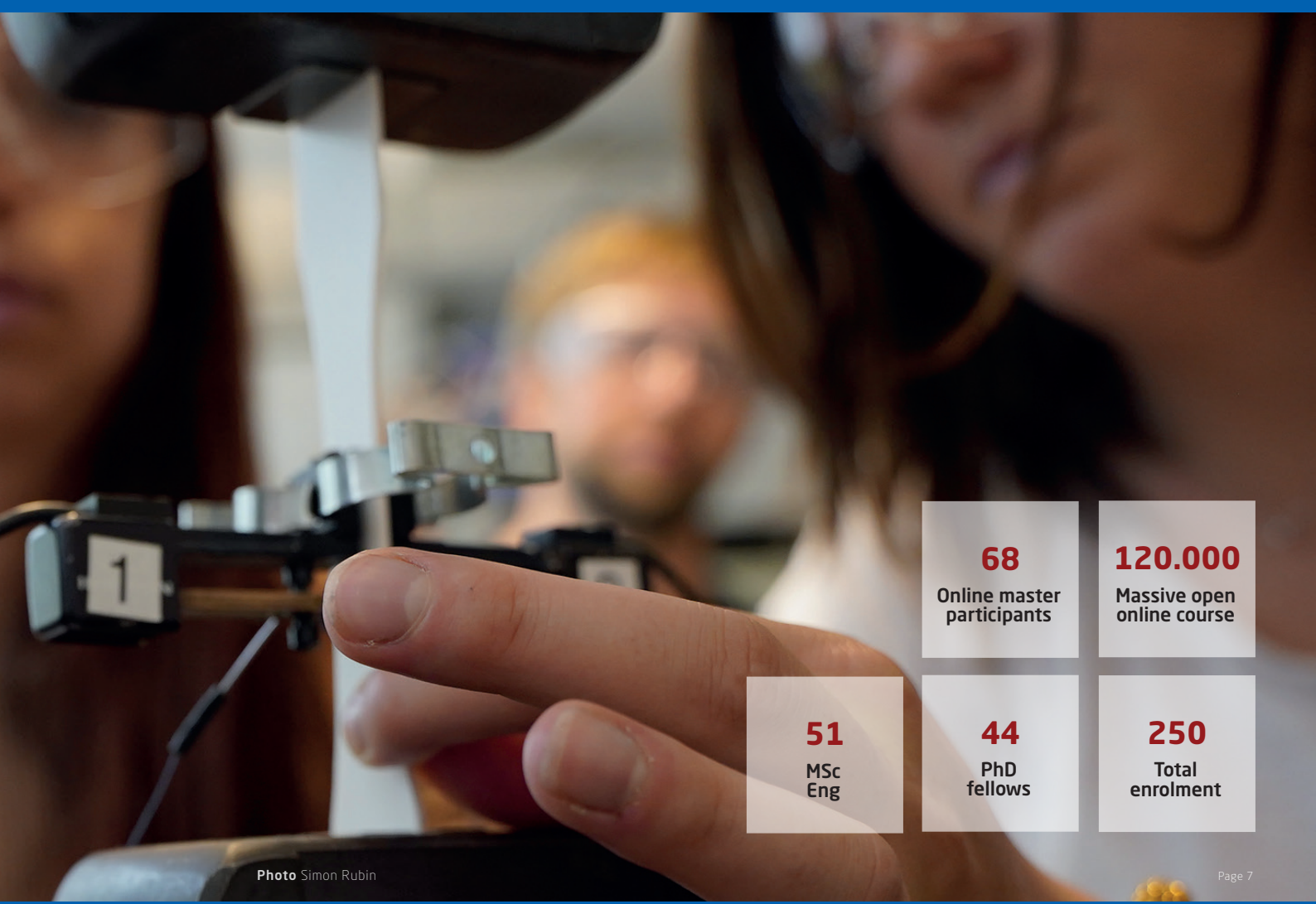
Nurturing future talents for the green transition is of vital importance to us; we want to pass on our knowledge to the next generation of wind energy engineers. Students from all over the world, studying here, benefit from the breadth of our knowledge and experience. We offer three dedicated study programmes in wind energy: The International MSc in Wind Energy programme, the European Wind Energy Master (EWEM), and the wind energy specialisation in the Sustainable Energy programme.

Online master's degree in wind energy

The online format offers exceptional flexibility for fitting courses around a busy schedule, with video tutorials, assignments, and discussion fora. Participants receive individual supervision from lecturers and participate in the Wind Energy Master community. The online master's is a fully accredited degree.

"In 2017 I wanted to change career and was looking at renewable energy. I graduated in 2019 and today I'm part of the team at Siemens-Gamesa that developed the first commercially available recyclable turbine blade. I wouldn't be where I am today without the DTU Online Master of Wind Energy."

Christian Søndergaard
Technology Manager



68
Online master participants

120.000
Massive open online course

51
MSc Eng

44
PhD fellows

250
Total enrolment

Photo Simon Rubin

Innovation

At DTU Wind Energy, innovation takes place at the intersection of our research and the needs of the industry. We have pioneered hard- and software solutions in areas such as advanced remote sensing technologies, new hybrid composite materials and software suites for components, turbine design, and windfarm siting.

Example:
ReliaBlade develops and demonstrates techniques to create digital twins for wind turbine blades with their unique defects and imperfections. The digital twin can track not only the current state of the blade but also predict the future state - as damages initiate and grow through its entire life cycle. ReliaBlade brings together 15 partners from the industry and academia. (www.reliablade.com)

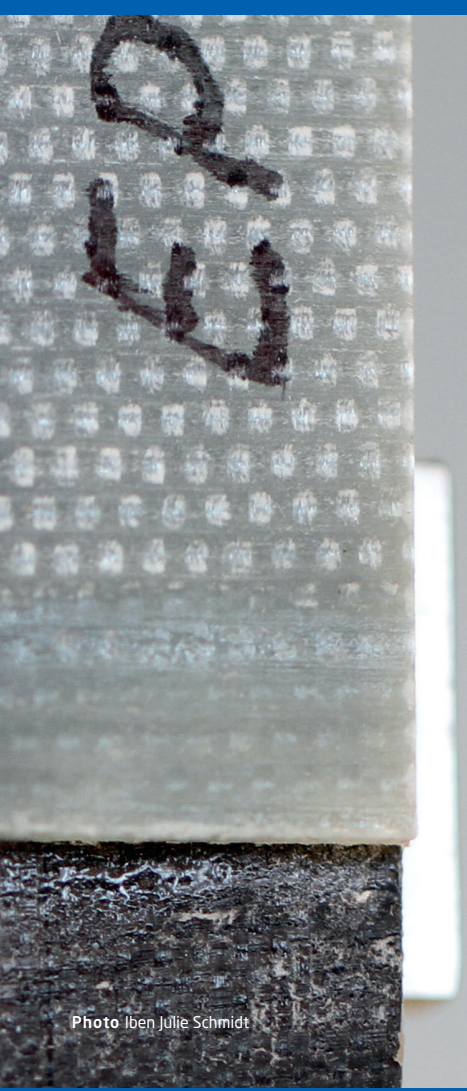


Photo Iben Julie Schmidt

Software

DTU Wind Energy offers several commercial software options that come with professional maintenance and support.

HAWC2	Horizontal Axis Wind turbine simulation Code 2nd generation
HAWCStab2	Aero-servo-elastic stability tool for wind turbines
BECAS	BEam Cross section Analysis Software
WAsP	Wind resource assessment, siting & energy yield calculations
WEng	Wind Conditions for turbine safety
TOPFARM	Wind Farm Optimizer

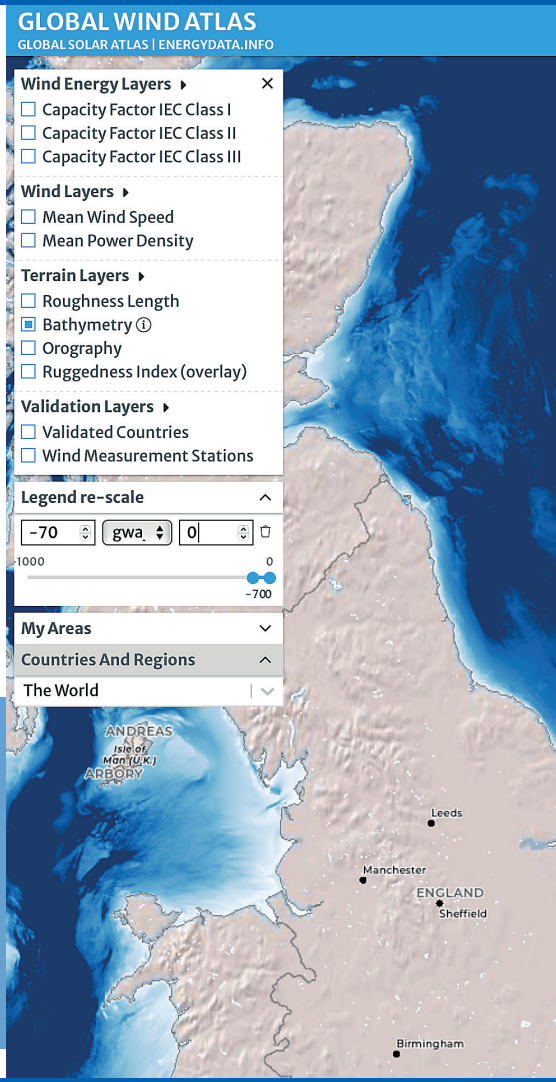
Scientific advice

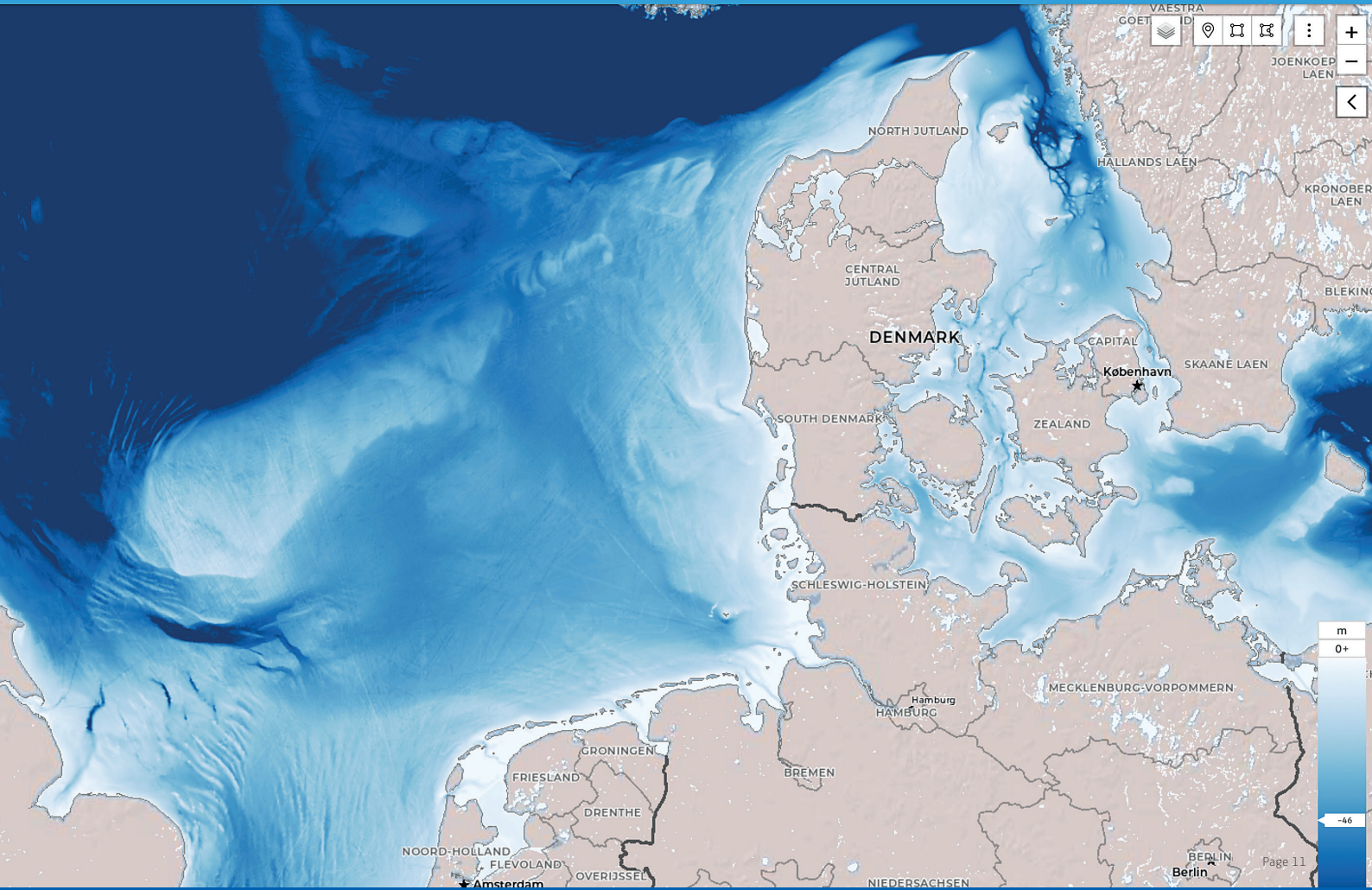
We provide research-based consultancy on five continents. In collaboration with the Danish Energy Agency and partners we support national and regional capacity building through training and the establishment of test centres. We have developed and facilitate the Global Wind Atlas* on an ongoing basis. The latest version have been created in partnership with the World Bank. Combined with national wind atlases developed by national authorities, it can be used to map the most suitable locations for wind energy deployment.

* a free-to-use webpage consisting of datasets and analysis tools with more than 25,000 monthly visitors (www.globalwindatlas.info)

The South African wind atlas

The Wind Atlas for South Africa (WASA) is a programme begun in 2009 to develop capacity and quality of wind resource assessment and mapping in South Africa. WASA develops and uses state-of-the art methods in collaboration with DTU Wind Energy and our South African partners. WASA phase 3 results were launched in 2021 with wind atlas data for South Africa in its entirety now accessible in the public domain.




VAESTRA GOETALAND
JOENKOEPING LAEN
NORTH JUTLAND
HALLANDS LAEN
KRONOBERG LAEN
CENTRAL JUTLAND
DENMARK
CAPITAL
SKAANE LAEN
København
SOUTH DENMARK
ZEALAND
SCHLESWIG-HOLSTEIN
MECKLENBURG-VORPOMMERN
Hamburg
HAMBURG
GRONINGEN
FRIESLAND
BREMEN
DRENTHE
NOORD-HOLLAND
FLEVOLAND
OVERIJSSEL
Amsterdam
NIEDERSACHSEN
BERLIN
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Research infrastructure

We operate some of the world's most advanced research infrastructure and test facilities for wind energy. Researchers and companies can test everything from nano-scale materials, large-scale structures to fully powered demonstrations of turbines. All commercial test activities are supported by our dedicated researchers and engineers.

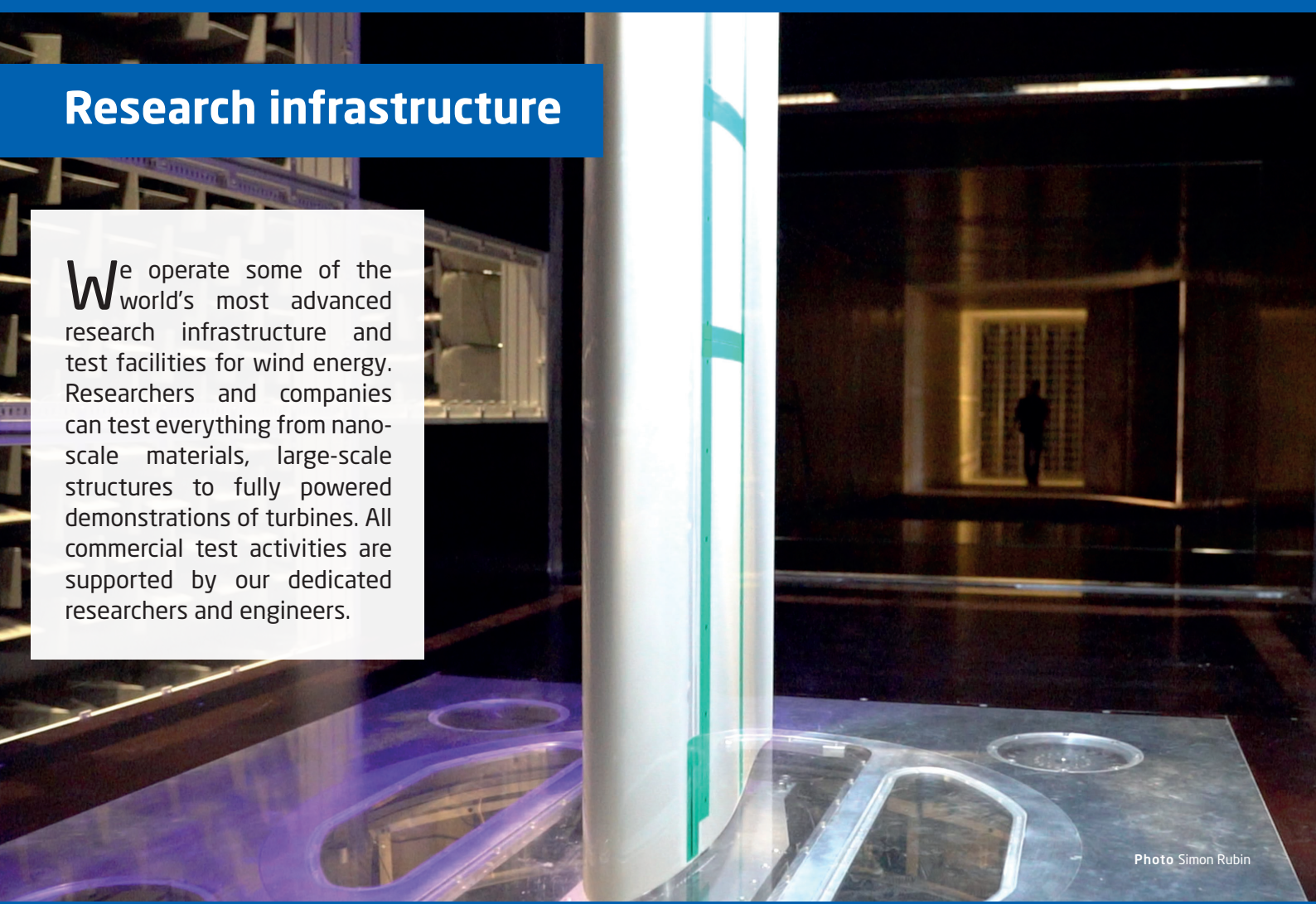


Photo Simon Rubin

Our flagship test facilities

Materials lab

The lab offers composite processing techniques, preparation of test specimens, accredited mechanical testing to meet industrial standards, X-ray computed tomography, electron microscopy, plasma treatment and surface chemistry, sensor instrumentation, and signal analysis.

Poul La Cour Tunnel

The largest university-owned wind tunnel in the world. It has been designed specifically for aerodynamic and aeroacoustic testing of airfoils and rotors. It is a closed-return tunnel with maximum flow speeds of up to 378km/h, similar to three-time hurricane strength.

Large Scale Facility

The 1560 m^2 test hall has three stands capable of testing up to 50-meter blades. Advanced structural tests and loading of turbine blades provide accurate data about strength, reliability and fatigue. We perform experimental research as well as demonstration of sensors and new digital solutions.

Østerild National Test Center

Located at the west coast of Northern Jutland the facility has some of the best wind conditions in the world, allowing manufacturers to test turbines before they enter the market. Its close proximity to the sea allows the testing of both on- and offshore turbines. The nine test stands are capable of trialling the new generation of mega-turbines up to 330 metres tall.

Other facilities

- AC/DC lab
- Windscanner
- Rotating Test Rig
- Risø Research Turbines
- Høvsøre Test center

Global outreach

Problem-solving and innovation goes beyond borders, and international collaboration ensures that our research and innovation stays at the forefront of trends and developments.

Top 10
Countries for collaboration

1. Denmark
2. Germany
3. UK
4. Spain
5. Norway
6. France
7. Belgium
8. Netherlands
9. Finland
10. Italy

90
Academic partners

257
Business partners

127
Research projects

35
Different countries

Photo Mattias Andersson

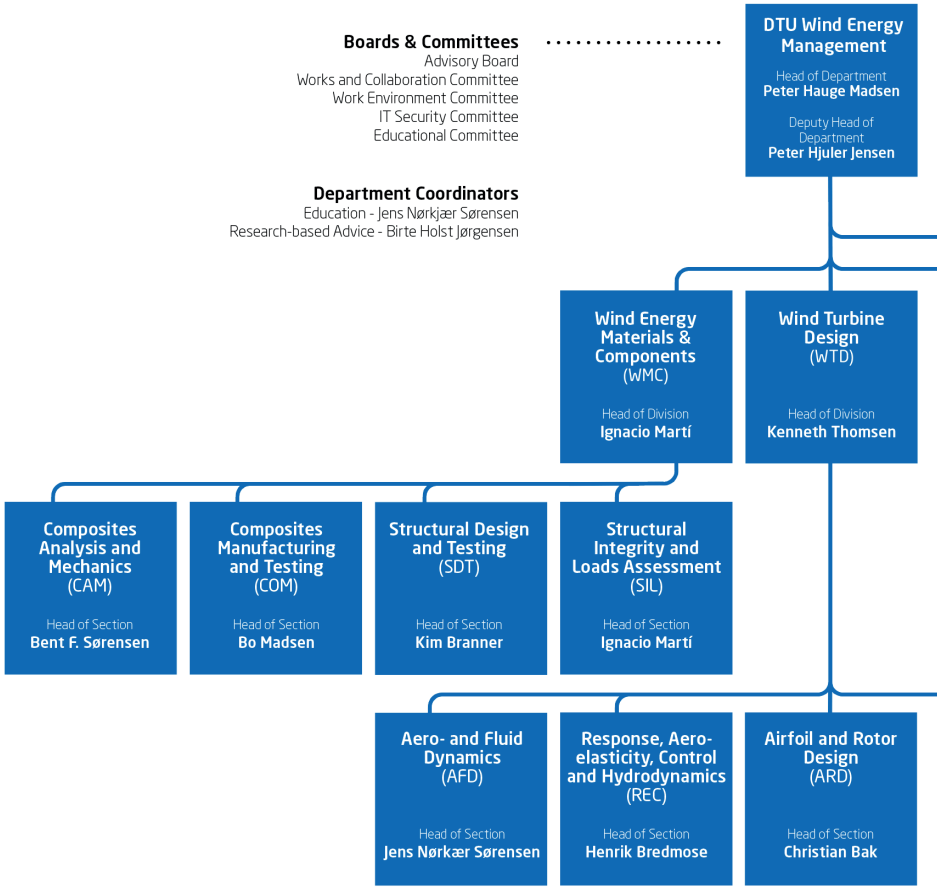
Collaboration

We are represented in all major national and international wind energy organisations and R&D platforms. We host the secretariat of the IEA Wind Technology Collaboration Programme facilitating more than 40 research projects with researchers all over the world.

Organization

We are organized in 3 divisions and 14 sections that in their entirety cover all aspects of the value chain: from material research through design concepts to execution of full-scale systems.

The organizational set-up reflects the new role of wind power in the energy systems as well as the continued need for development of new wind turbine technology and materials and components research.



Management Group
Head of Department
Deputy Head of Department
Head of Administration
Head of Divisions

Management Forum
Management Group
Head of Sections
Department Coordinators

Administration
Head of Administration
Søren Knudsen

Wind Energy Systems (WES)
Head of Division
Cathy Suo

- **Resource Assessment and Meteorology (RAM)** — Head of Section: **Jake Badger**
- **Meteorology and Remote Sensing (MES)** — Head of Section: **Jakob Mann**
- **System Engineering and Optimization (SYS)** — Head of Section: **Katherine Dykes**
- **GRID Integration and Energy Systems (GRD)** — Head of Section: **Gregor Giebel**
- **Society, Market and Policy (SMP)** — Head of Section: **Lena Kitzing**
- **Testing and Calibration (TAC)** — Head of Section: **Allan Vesth**
- **Measurement Systems and Methods (MEM)** — Head of Section: **Michael Courtney**

268 employees

50% with international background

68% researchers

12 professors

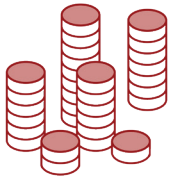
44 PhD fellows

25% women

Finances

Income

€28 million



20%
Research subsidies (core government funding)

36%
External funds (research)

6%
Scientific advice

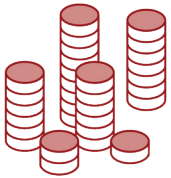
1%
Other revenue

5%
Education subsidies (government funding)

38%
Commercial revenue

Ordinary operating costs

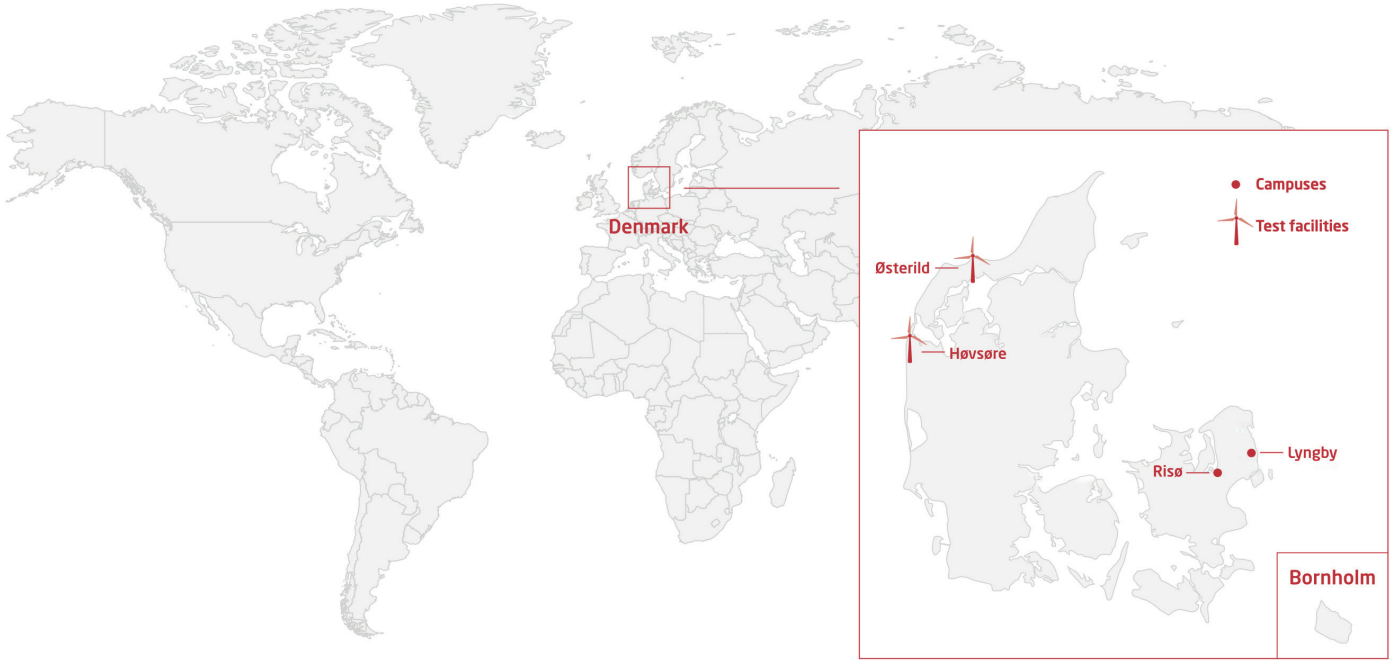
€25 million



30%
Other operating costs

70%
Staff (salaries)

Location


Denmark
Campuses
Test facilities
Østerild
Høvsøre
Risø
Lyngby
Bornholm

DTU Wind Energy

DTU Wind Energy
Campus Risø
Frederiksborgvej 399
4000 Roskilde

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