

How Wind Works

Wind energy plays a key role in Germany's energy transition („Energiewende“). But there is still plenty of room for improvement. Mankind needs to gain a better understanding of the wind. The Oldenburg „turbulence researchers“ at the ForWind Center for Wind Energy Research are doing important pioneering work in this area. They simulate and measure rotor blade wind flow on their computers, in a wind tunnel and in field tests. A story in pictures

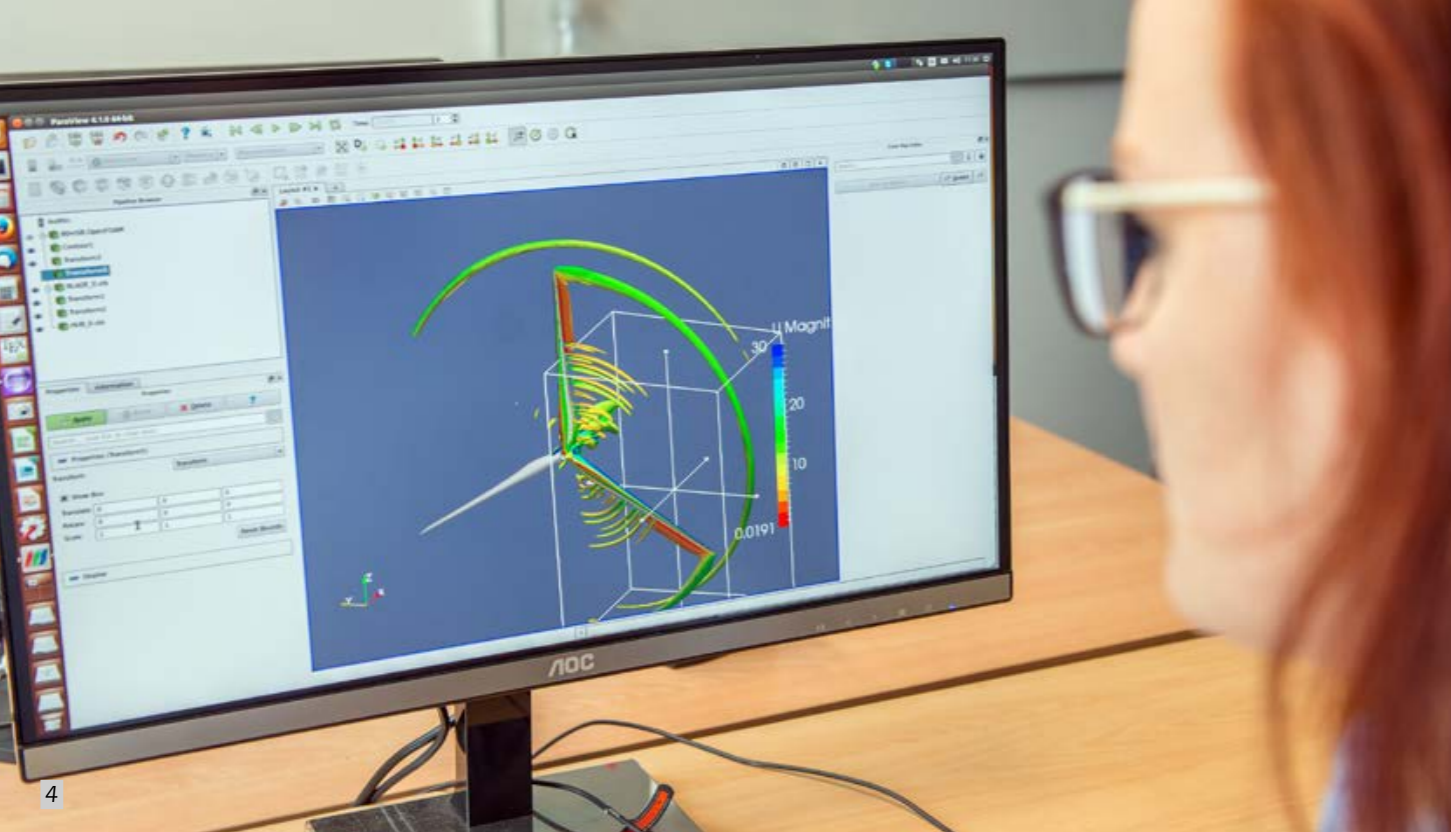


1 ForWind, the joint Centre for Wind Energy Research of the Universities of Oldenburg, Hannover and Bremen, recently acquired one of the largest turbulent wind tunnels in Germany. Inside this tunnel and with the help of four huge turbines they can simulate the wind fields, or wind patterns, that occur in nature.

2 Thanks to air baffles up to six metres high, the wind blows at constant speeds of up to 40 meters per second around the curve of the wind tunnel without any loss of flow.

3 The wind tunnel is a prominent feature of the new "WindLab". This four-storey building accommodates more than 130 scientists from the fields of physics, meteorology, oceanography and engineering. Together they are studying the interactions between turbulent atmospheric currents and wind farms, wind turbines and their components.



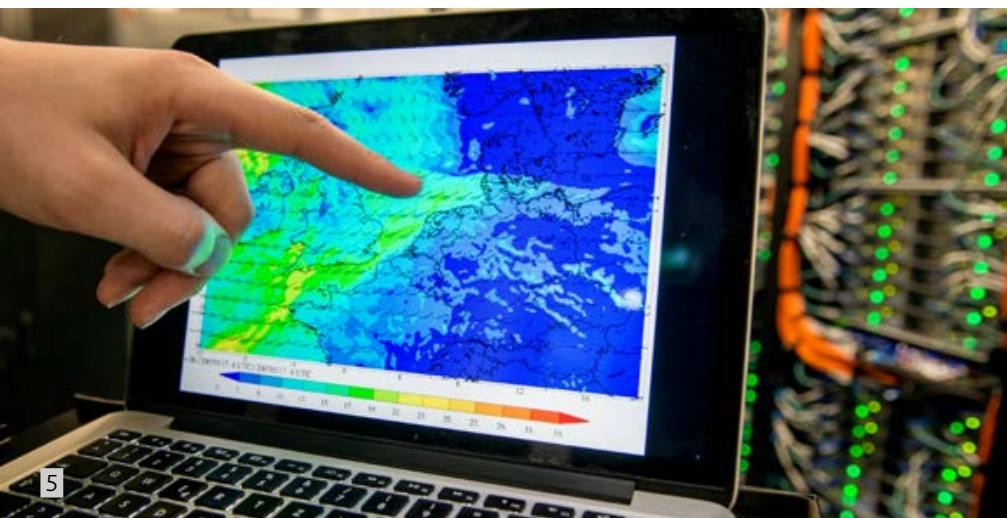


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7 At open area test sites the scientists measure the "real" external influences to which the wind farm is exposed. The photo shows a 3D scanner being set up.



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4 Tests in the wind tunnel require a lot of preparation. One important step is computer modelling.

5 Thanks to its high-performance computing cluster ForWind can create large-scale simulations. For instance the Oldenburg wind researchers can calculate the extensive impact of windstorm Kyrill, which raged across Western Europe in 2007, on Europe's energy system.

6 Laboratory tests are performed to check the computer-generated simulations. The picture shows a laser measurement of the wind flow around a rotor blade segment.



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8 For large-volume measurements of wind fields ForWind uses the laser-based measuring system LiDAR, a method of optical distance and speed measurement that is related to radar.

9 With its measurements ForWind also provides accurate data about the operational behaviour of large offshore wind farms. The tests help to increase the efficiency of the farms and to avoid technical and financial risk factors.