

# RAVE

The research initiative RAVE carries out research and development work on the first German offshore wind farm alpha ventus. The experience and knowledge generated contribute to the advancement of offshore wind power.

In more than 35 research projects, more than 60 partners from science and industry have been working on a wide range of research questions since 2008. The topics range from the further development of turbines and foundations to the optimization of operations.

[www.rave-offshore.de](http://www.rave-offshore.de)

Supported by:



Federal Ministry  
for Economic Affairs  
and Climate Action

on the basis of a decision  
by the German Bundestag

Co-ordinated by:



**Fraunhofer**  
IWES

**Dr. Bernhard Lange**  
[bernhard.lange@iwes.fraunhofer.de](mailto:bernhard.lange@iwes.fraunhofer.de)

**Maren Engelhardt**  
[maren.engelhardt@iwes.fraunhofer.de](mailto:maren.engelhardt@iwes.fraunhofer.de)

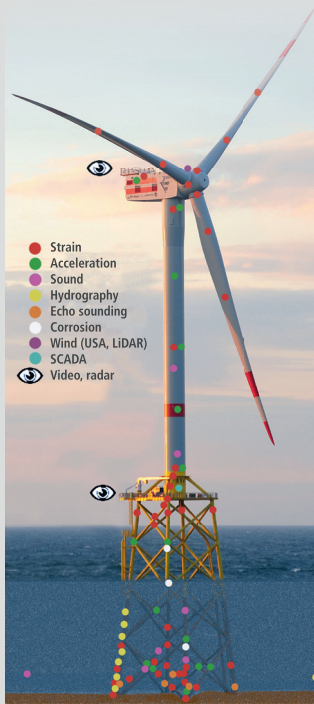
[www.iwes.fraunhofer.de](http://www.iwes.fraunhofer.de)

Measurement Data

**RAVE**   
RESEARCH AT ALPHA VENTUS

## Senvion 5M

The AV04 and, to a lesser extent, AV05 turbines are equipped with strain and acceleration sensors in the nacelle, rotor, tower, and support structure, as well as a variety of other sensors. Data from the turbine's SCADA system was also recorded. The measurements are carried out by DNV (GL Garrad Hassan Deutschland GmbH). Extensive information on turbine design is also accessible, including the met-ocean design base, load simulation information and data, model parameters and turbine control information.



Photo©DOTI | Matthias Ibeler, 2009

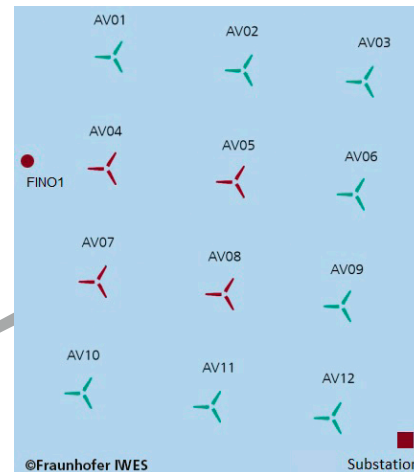
## FINO1

The FINO1 platform captures and records a wide range of different meteorological and oceanographic parameters, e.g. wind at heights between 30 m and 100 m.

Photo © Bundesamt für Seeschifffahrt und Hydrographie (BSH)

## Measurements in RAVE

Measurements have been carried out within RAVE since 2009. The data collected in RAVE includes measurements over many years of two turbine models, two support structures, substations and the FINO1 wind measurement mast. At times, more than 1,200 measurement channels were in operation. Extensive documentation of the measurement program and design data for one turbine type are also available for research. Measurements continue, but some sensors have ceased operation.



Graphic © Fraunhofer IWES

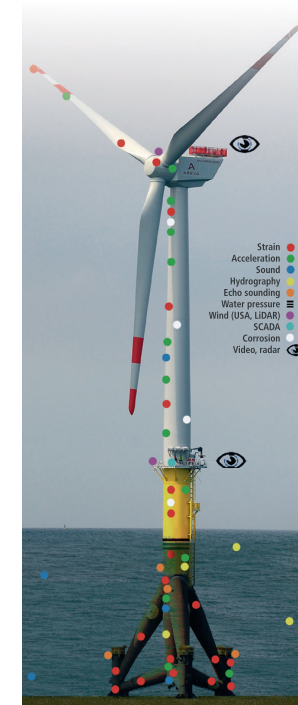
## Additional measurements

Alpha ventus is connected to the power grid by means of an AC transmission cable between an offshore and an onshore substation. Electrical measurements were taken at both substations over many years.

In addition to the longterm measurement program, special measurement campaigns (underwater sound, nacelle lidar, ...) were also carried out over a limited period of time as part of several research projects.

## Adwen 5000M

The structural dynamic measurements on the AV07 and AV08 turbines are performed by UL International GmbH. The sensor sites can be grouped into four categories: nacelle; rotor; tower; and support structure. A large number of other sensors and SCADA data are also available.



Photo©Stiftung OFFSHORE-WINDENERGIE

## Data access

RAVE's goal is to promote research into offshore wind energy and make this completely unique data available for research purposes. All the measurements are stored in the RAVE data archive operated by the Federal Maritime and Hydrographic Agency (BSH). Users can download the data free of charge from this data archive for research purposes, subject to signature of the RAVE data usage agreement. For more details, use the QR-code or see [www.rave-offshore.de](http://www.rave-offshore.de).

