

## RAVE: Research at alpha ventus

The first German offshore wind farm alpha ventus hosts the RAVE initiative (Research at alpha ventus). Windturbines from two manufacturers (Senvion 5M and Adwen 5000M), a permanent met mast and an offshore substation are located in the German Bight. The experience and knowledge generated contribute to the advancement of offshore wind power. More than 60 partners from science and industry have been working on a wide range of research questions since construction in 2008. The topics range from ecology, further development of turbines and foundations to optimization of operations regarding environmental and technical issues. The turbines are located 43 to 45 kilometers north-northwest of the island "Borkum" in the German Exclusive Economic Zone (EEZ) of the North Sea, i.e. outside the 12-nautical-mile limit. The water depths range depending on the tide from 27-30 meters. The coordinates of the met mast directly located windwards alongside the windfarm (FINO 1 platform) are 6°35'15.58"E 54°00'53.94"N. [www.rave-offshore.de](http://www.rave-offshore.de)



### Measurements in RAVE

Measurements have been collected in the scope of RAVE since operation in 2009. The data collected over the many years cover measurements from two turbine models, two support structures, onshore and offshore substations, a measuring mast and a recently installed measurement twin. Furthermore, more than 35 research projects and several measurement campaigns contributed additional data related to the wind farm. At times, there were more than 1,200 measuring channels operating simultaneously. Measurements are ongoing and up to now have generated more than 50 TB of data.

### Data access

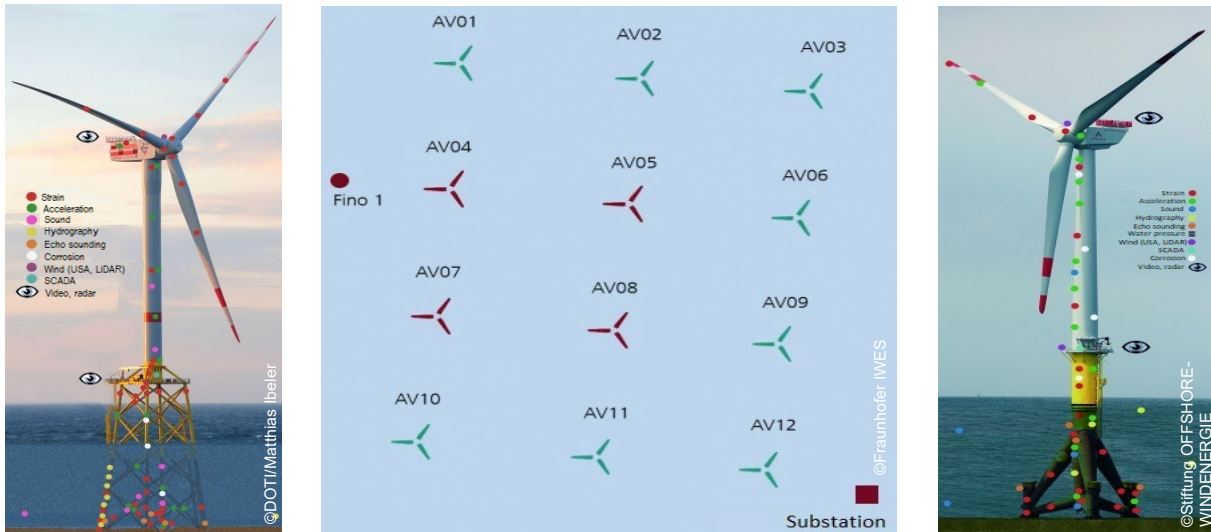
RAVE's goal is to promote research into offshore wind energy and make this completely unique [data available](#) for research purposes. All the measurements and campaign data are stored in the RAVE data archive operated by the Federal Maritime and Hydrographic Agency (BSH). Users can download the data from this data archive for research purposes, subject to signature of the RAVE data usage agreement. For more details: <https://rave-offshore.de/en/data.html>.

## Senvion 5M

Turbines AV04 and to a lesser extent AV05 are equipped with strain and acceleration sensors in nacelle, rotor, tower and support structure as well as with a multitude of other sensors. Also, data from the turbine's SCADA system have been recorded. The measurements are collected and supervised by GL Garrad Hassan Deutschland GmbH.

## 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, SCADA and measurement twin data are also available.



## FINO 1

The FINO 1 platform captures and records a wide range of different meteorological and oceanographic parameters, e.g. wind at heights between 30 m and 100 m.

## Grid connection measurements

The alpha ventus wind farm is connected to the onshore "Hager Marsch" substation via an offshore substation and a transmission cable. Different electrical parameters are recorded at both substations.

## Offshore Wind R&D Conferences, RAVE Workshops and RAVE Newsletter

Former conferences and annually conducted [RAVE workshops](#) are framework for regular exchange of experience on working with the RAVE data and on the development of the offshore wind energy in general. Participants recruit from many different countries and areas. If you are interested to receive our newsletter, please send us an e-mail to the following address: [raveworkshop@iwes.fraunhofer.de](mailto:raveworkshop@iwes.fraunhofer.de)

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