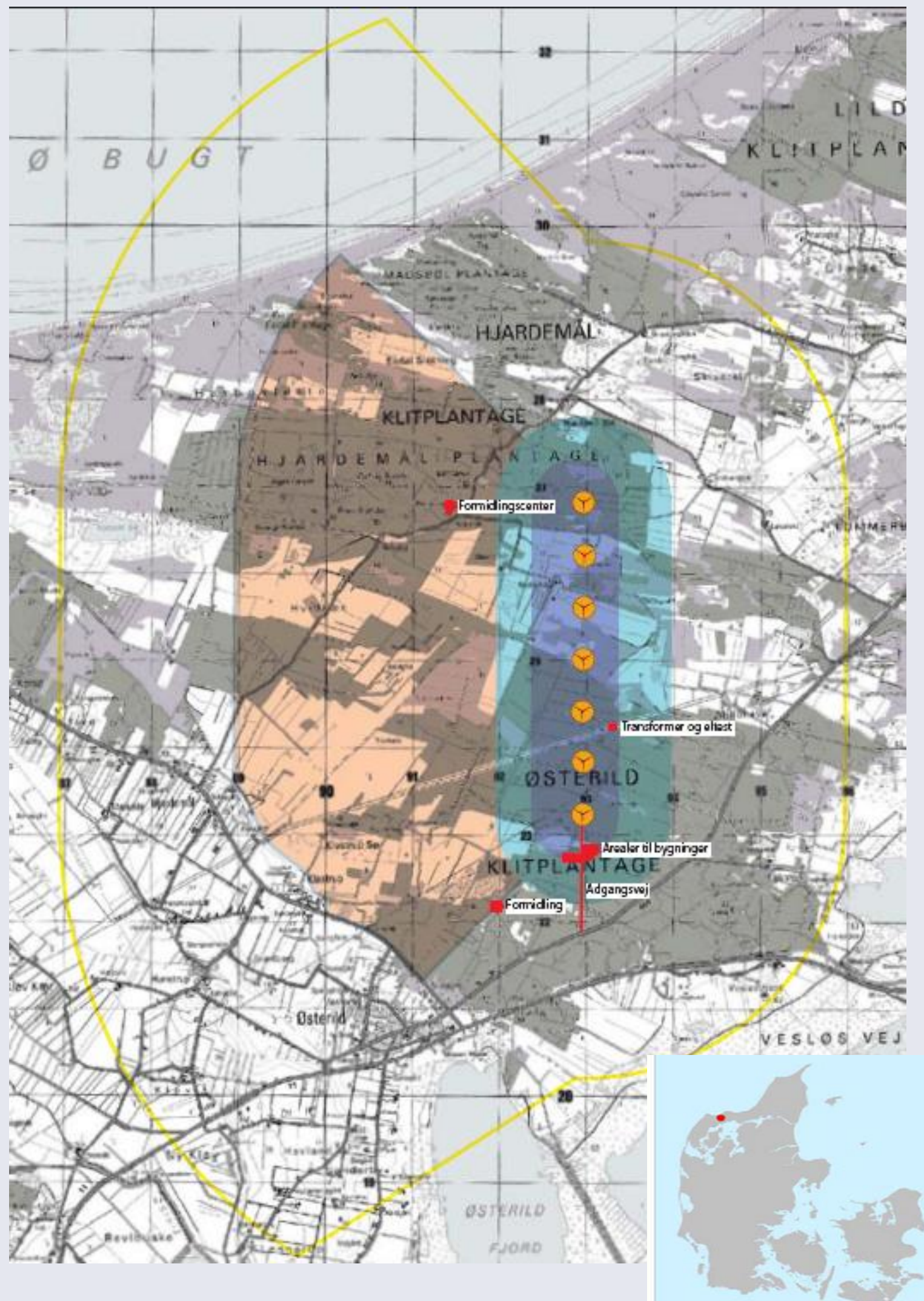


Abstract



Photo: DTU Wind Energy



In June 2010 the Danish Government passed a law in order to establish a National Test Centre for Large Wind Turbines at Østerild, where new wind turbine prototypes could be tested. The Technical University of Denmark (DTU) was appointed to be head of the establishment and operation of the new wind turbine prototype test facility.

Thus, the Test Centre was established for the State of Denmark by DTU together with Vestas Wind Systems A/S (Vestas) and Siemens Wind Power A/S (Siemens). The centre consists of seven test stands located north-south with a distance of 600 metres. It is designed to test wind turbines for the future – each of them up to 16 MW, 250 metres tip height, and a rotor diameter of up to 220 metres. All costs related to the establishment of National Test Centre at Østerild are fully paid by the industry.

Four test stands are owned by Vestas and Siemens and three test stands are owned by DTU and presently rented to the Global Wind Industry through an open tender. The three test stands are now rented to Envision Energy, EDF Energies Nouvelles and Vestas Wind Systems A/S. The test facility was inaugurated in October 2012 and four wind turbines are or have been tested until now. The expectation is that the last there wind turbines will be erected in 2015.

The Test Centre's geographical location and facilities allow for the wind turbine industry in collaboration with DTU and other research institutions to carry out research, development and tests of prototype wind turbines and new wind turbine technology.

Test and measurements offered by DTU

The National Test Centre for Large Wind Turbines at Østerild is located in an area with very good wind and turbulence conditions for testing very large offshore wind turbines. In average it is possible to perform 12 power curve measurements (according to IEC) per year if the wind conditions alone determined the capacity to measure power curves.

- Accredited to carry out **power curve measurements** according to IEC 61400-12-1, MEASNET and FGW technical guide lines.
- Accredited to carry out measurements of **mechanical loads** according to IEC TS 61400-13.

- Further accreditation** according to ISO 17025 for:
 - Measurement of yaw effectiveness for wind turbine in operation
 - Measurement of wind resources
 - Measurement of wind speeds
 - Correction of wind speed measured with nacelle anemometer to free wind speed



- DTU was the first university in the work that has been accredited to carry out **ground-based LIDAR calibrations**.

Estimated long-term mean wind speeds at 120m

Test stand	UTM WGS84 zone 32 E [m]	UTM WGS84 zone 32 N [m]	Long-term mean wind speed [m/s]	Long-term Weibull A parameter [m/s]	Long-term Weibull k parameter
1	492967	6326734	8.80	9.91	2.62
2	492967	6326134	8.80	9.91	2.63
3	492967	6325534	8.79	9.89	2.62
4	492967	6324934	8.76	9.86	2.62
5	492967	6324334	8.72	9.81	2.61
6	492967	6323734	8.67	9.76	2.60
7	492967	6323134	8.63	9.72	2.59
Average			8.74	9.84	2.61

Wind Turbines in Østerild (March 2015)

Stand (no)	Turbine Company (model)	Effect (MW)	Diameter (m)	Hub / Tip height (m)
1	EDF EN (2015)	?	?	? / ?
2	Vestas V164	8.0	164	140 / 222
3	Vestas V126	3.3	126	116 / 179
4	Vestas (2015)	?	?	? / ?
5	Envision (2015)	?	?	? / ?
6	Siemens (SWT-6.0)	6.0	154	120 / 197
7	Siemens (SWT-4.0)	4.0	120	110 / 170

Installation of Wind Turbines



Photo: DTU Wind Energy



Photo: DTU Wind Energy



Photo: DTU Wind Energy

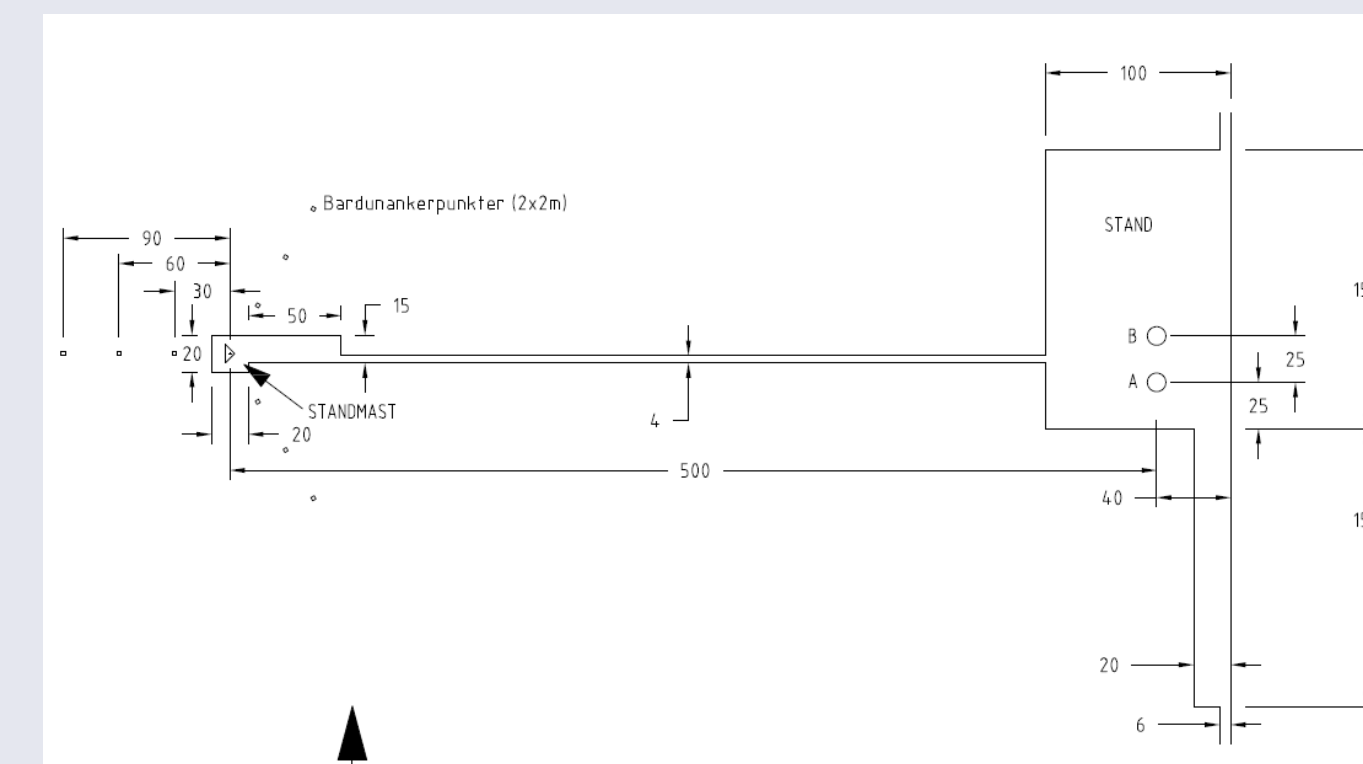
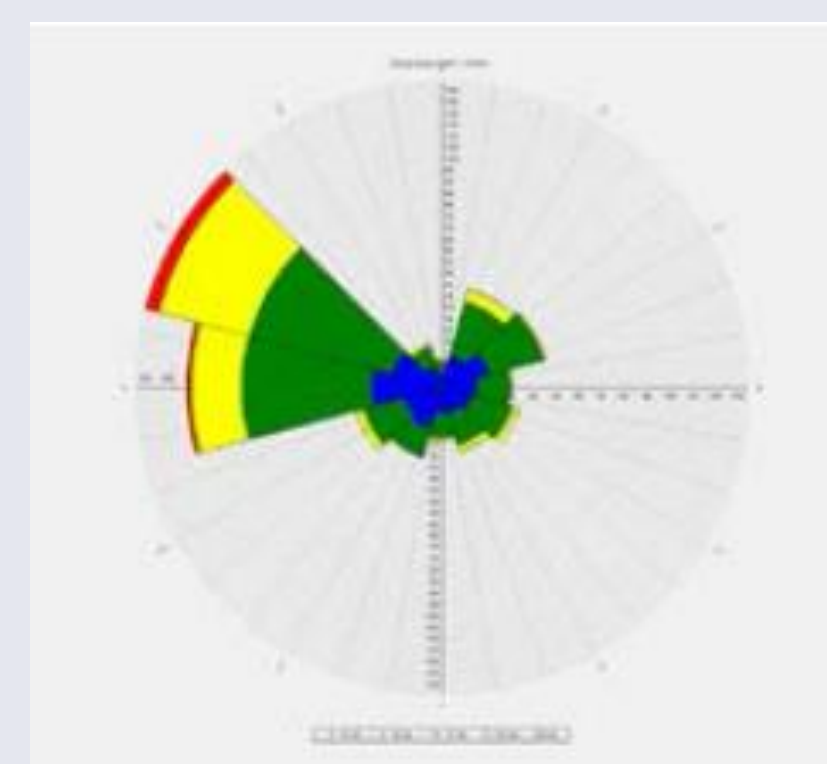
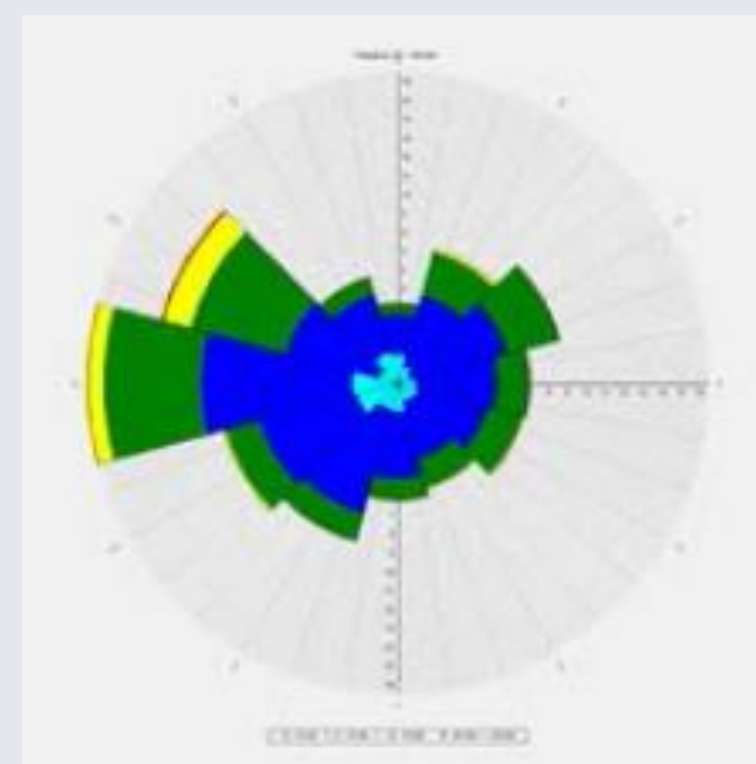


Photo: Siemens Press

Østerild – Facts & Numbers

- 7 test stands for large prototype wind turbines
- 600 metres between the wind turbines
- 500 metres in front of the wind turbines to the west a measurement mast is erected
- 250 m is the maximum height to the top blade tip (Stand 1 only 210 m)
- 110 metres is the maximum length of the blades
- 220 metres diameter can the rotor be up to
- 38,000 m² is the area the largest rotor can cover
- 16 MW is the maximum output per wind turbine
- 112 MW is the combined power production
- 245 hectares plantations have been cleared at the test centre
- 393 hectares of new forest will be planted around Denmark
- 200,000 m² roads and spaces were installed
- 110,000 m³ gravel was used
- The test centre main road measures 5 km from Gl. Aalborgvej in the south to the lighting mast in the north
- 13 km electric cables are buried in the ground
- 28 km fibre has been buried in the ground
- 9 km of copper netting has been put in the ground as an equalisation network
- 9 masts, with a combined height of 1680 m have been erected
- 11.5 km steel wire supports the masts

Wind Direction Frequency & Power Density distribution



DTU Wind Energy

As of 1st January 2012, DTU has taken the support to the industry research collaboration, innovation and public sector consultancy one step further by bringing together all groups with activities within wind energy into a new department of wind energy, DTU Wind Energy.

There are more than 240 staff members, including 160 academic staff members and nearly approximately 50 PhD students.

DTU Wind Energy
September 2014

References

- About Østerild:
<http://www.vindenergi.dtu.dk/english/About/Oesterild>
- About DTU Wind Energy:
<http://www.vindenergi.dtu.dk/english>

