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# Monitoring Offshore Wind Energy Use

Status Quo - how are the offshore wind farms faring?



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# Monitoring Offshore Wind Energy Use

- Introduction (Offshore~WMEP)
- Offshore development (EU)
- First results
- Conclusions

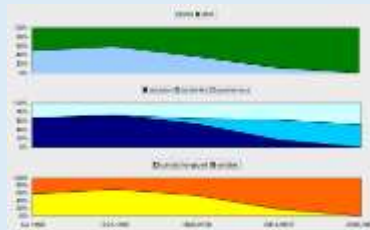


# WMEP

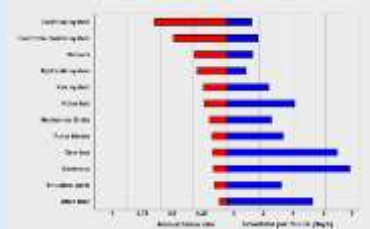
Scientific **M**easurement and **E**valuation Program („250 MW Wind“ (1989-2006))

193.000 monthly operation reports  
and 64.000 Incident reports  
from 1.500 wind turbines

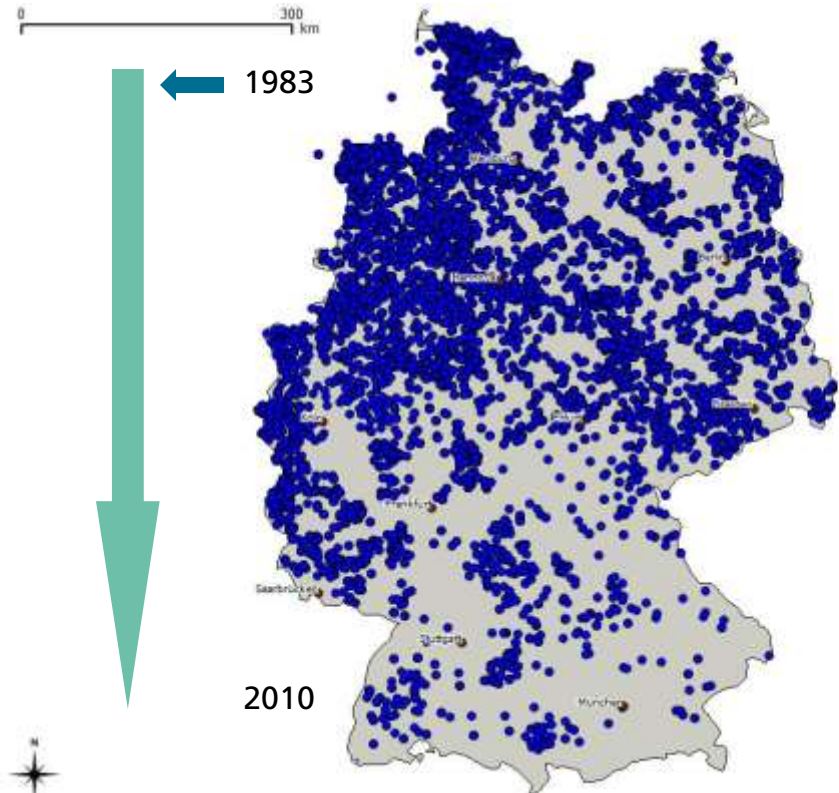
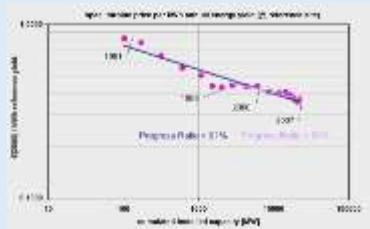
Technology development



Reliability



Learning curves



# Offshore~WMEP

## Aims of project

To answer fundamental questions on development of the utilization of wind power offshore

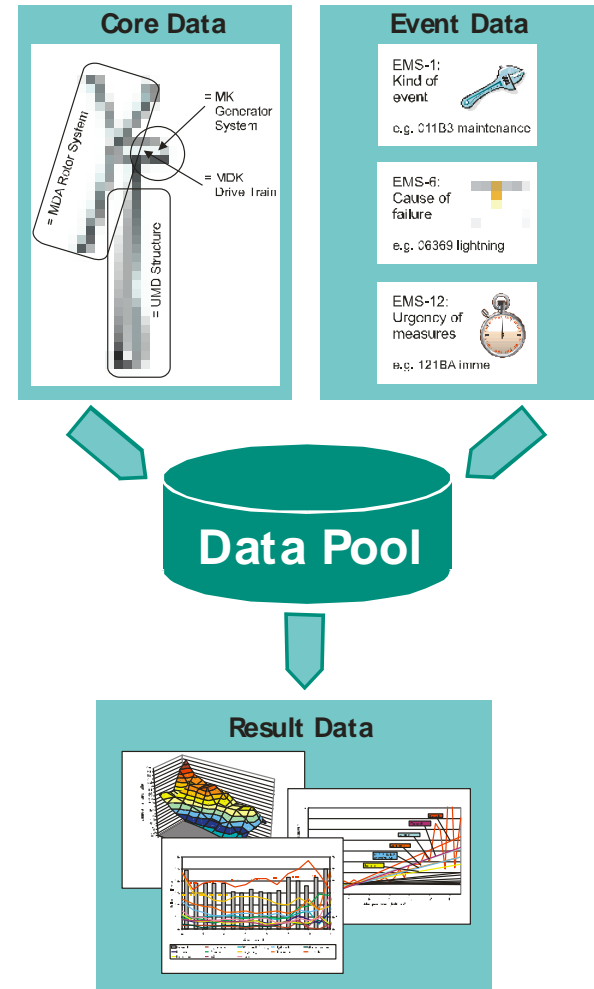
➡ General monitoring

To optimize maintenance and availability

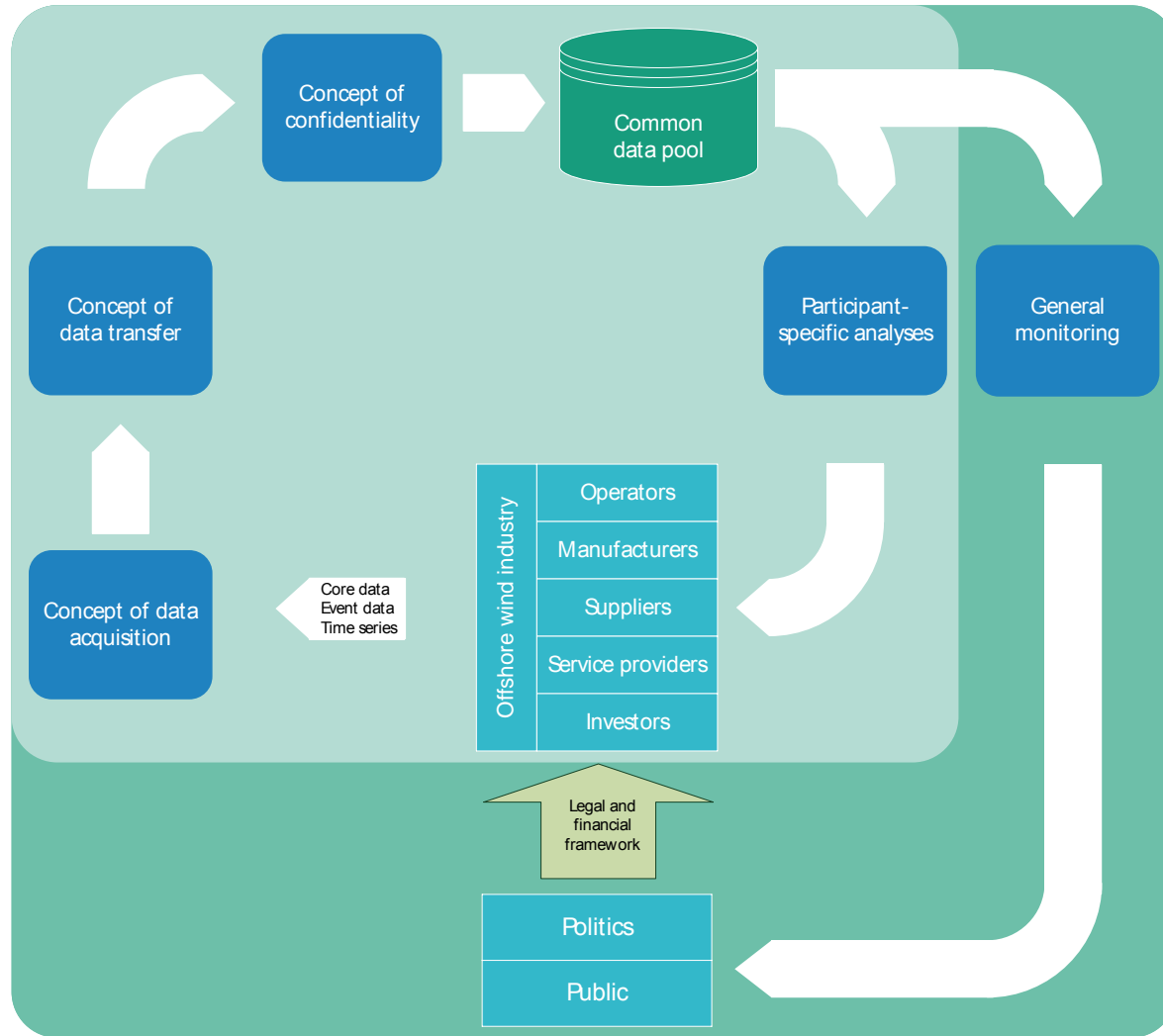
➡ Systematical collection and evaluation of operational experiences

By building up a common data base

Funded by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety



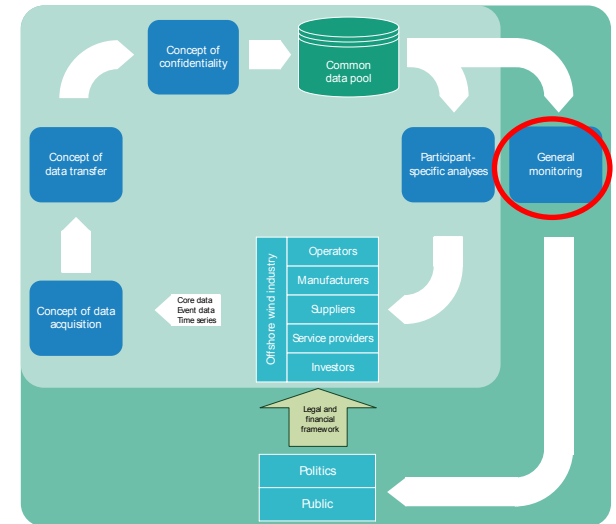
# Offshore~WMEP



# Offshore~WMEP

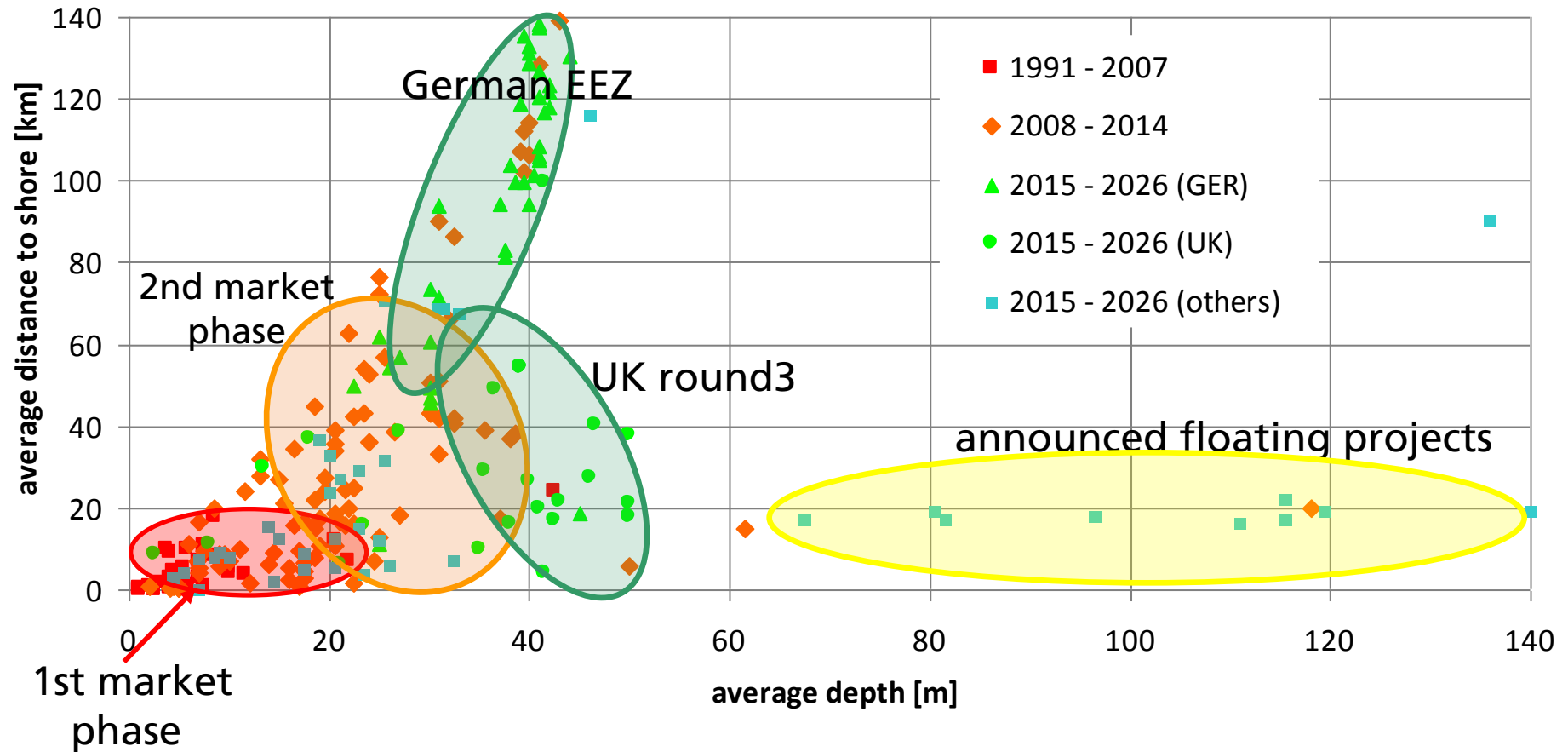
## ■ Core issues

- Site-specific offshore conditions
- Installation
- Energy output
- Reliability
- Availability
- Facility concepts
- Operation and maintenance concepts
- Investment and operating costs



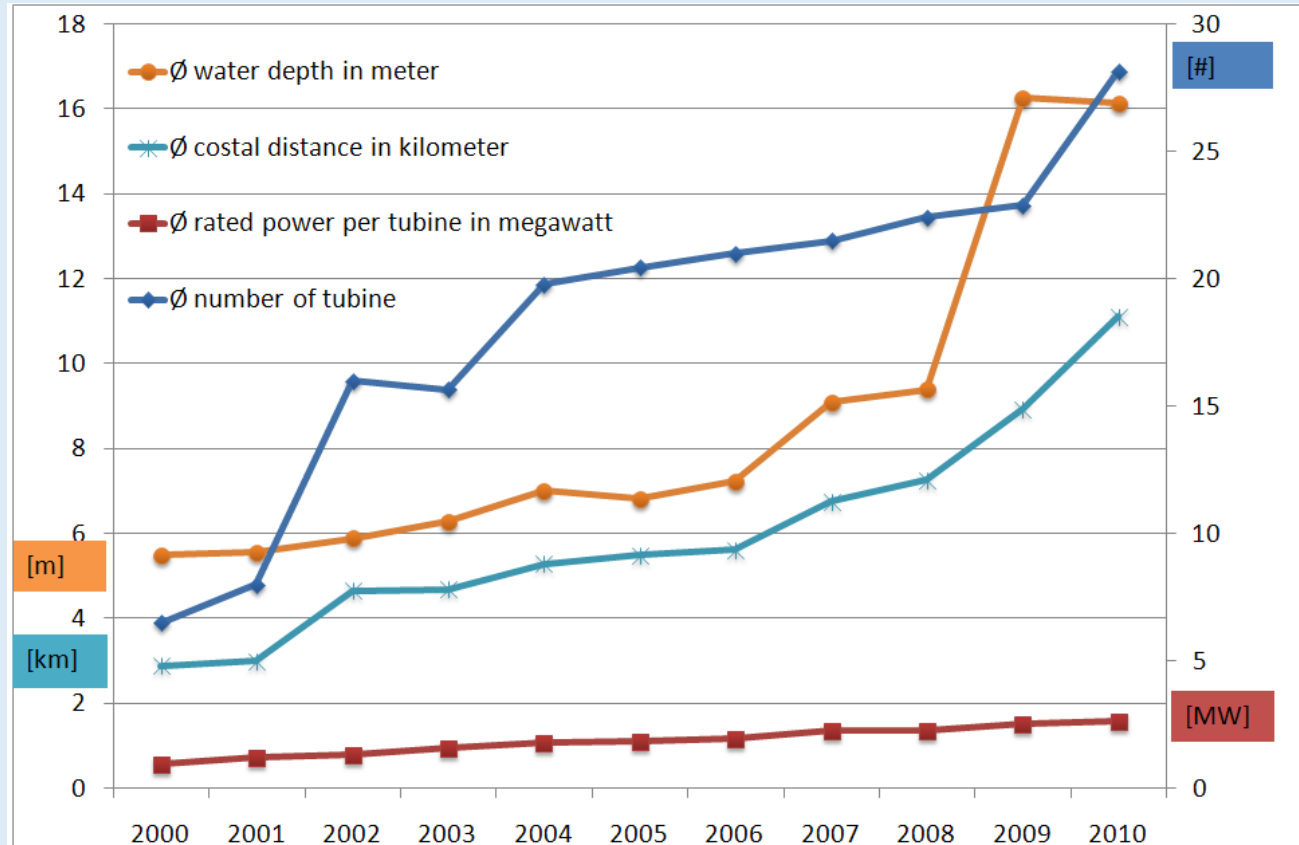
# Offshore development

- Development phases of the EU offshore wind market in terms of water depth (m) and distance to shore (km) up to 2025



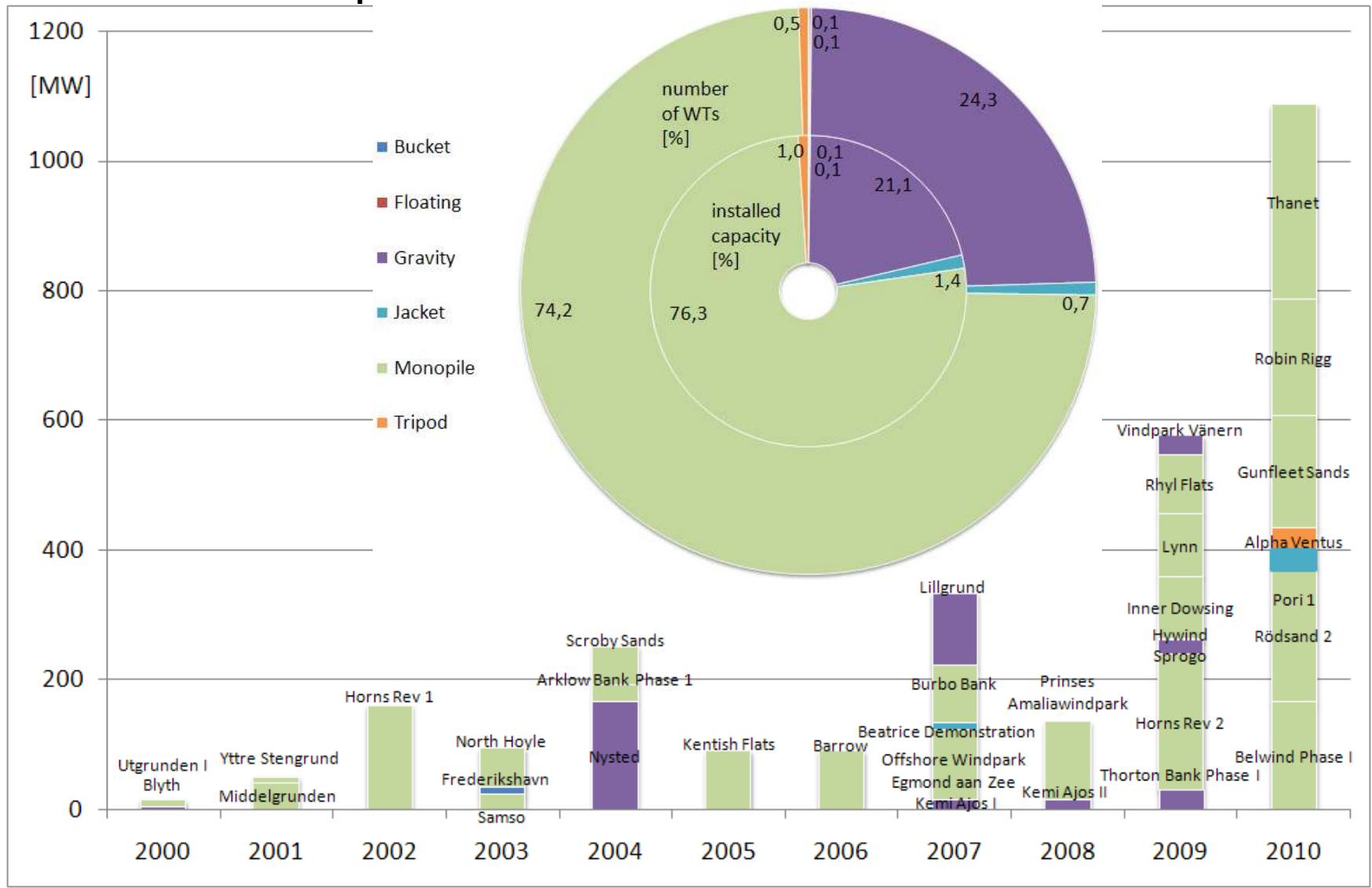
# Offshore development

- Improvements in wind turbine technology
- Changes in site conditions in terms of costal distance and water depth



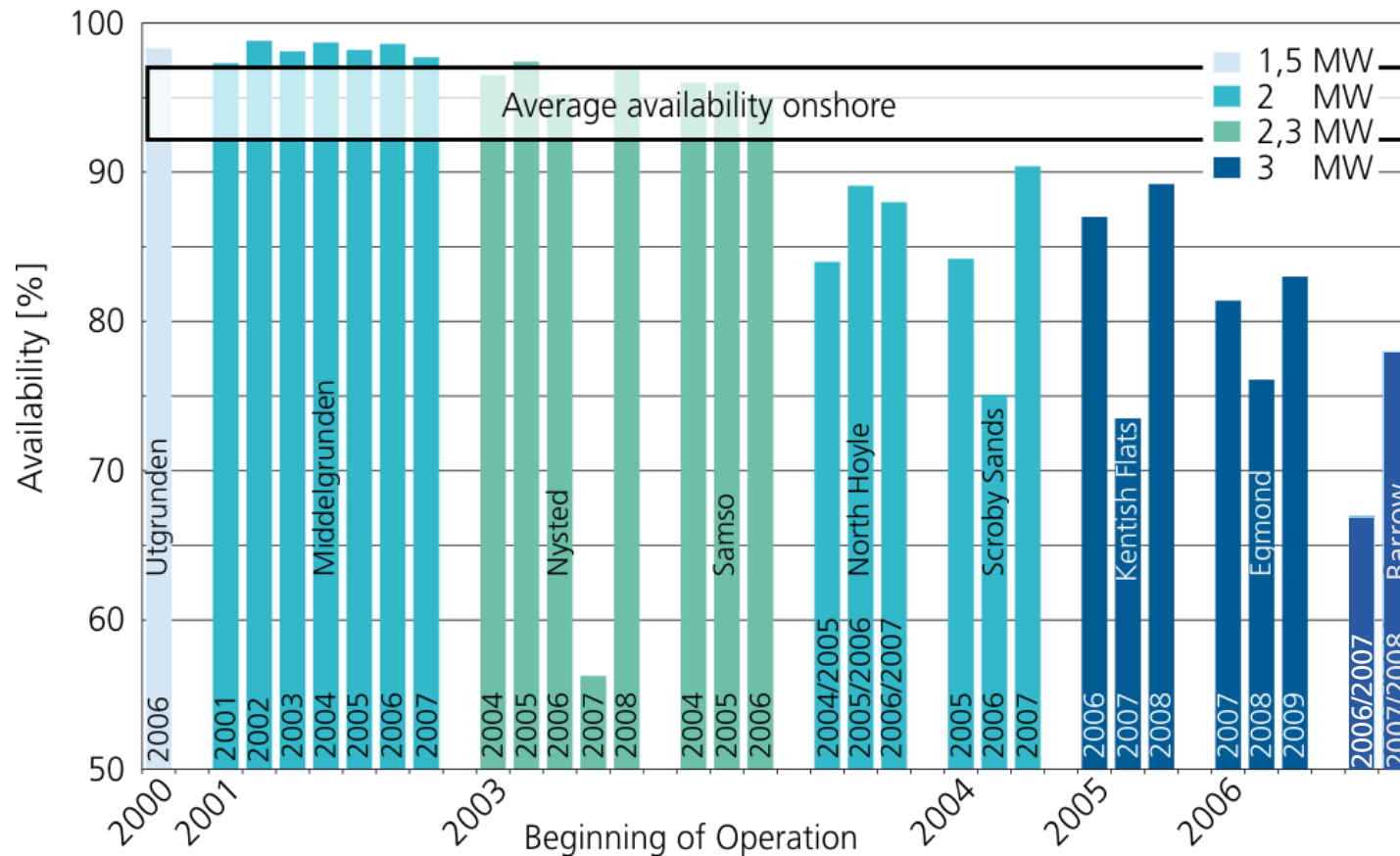


# Offshore development



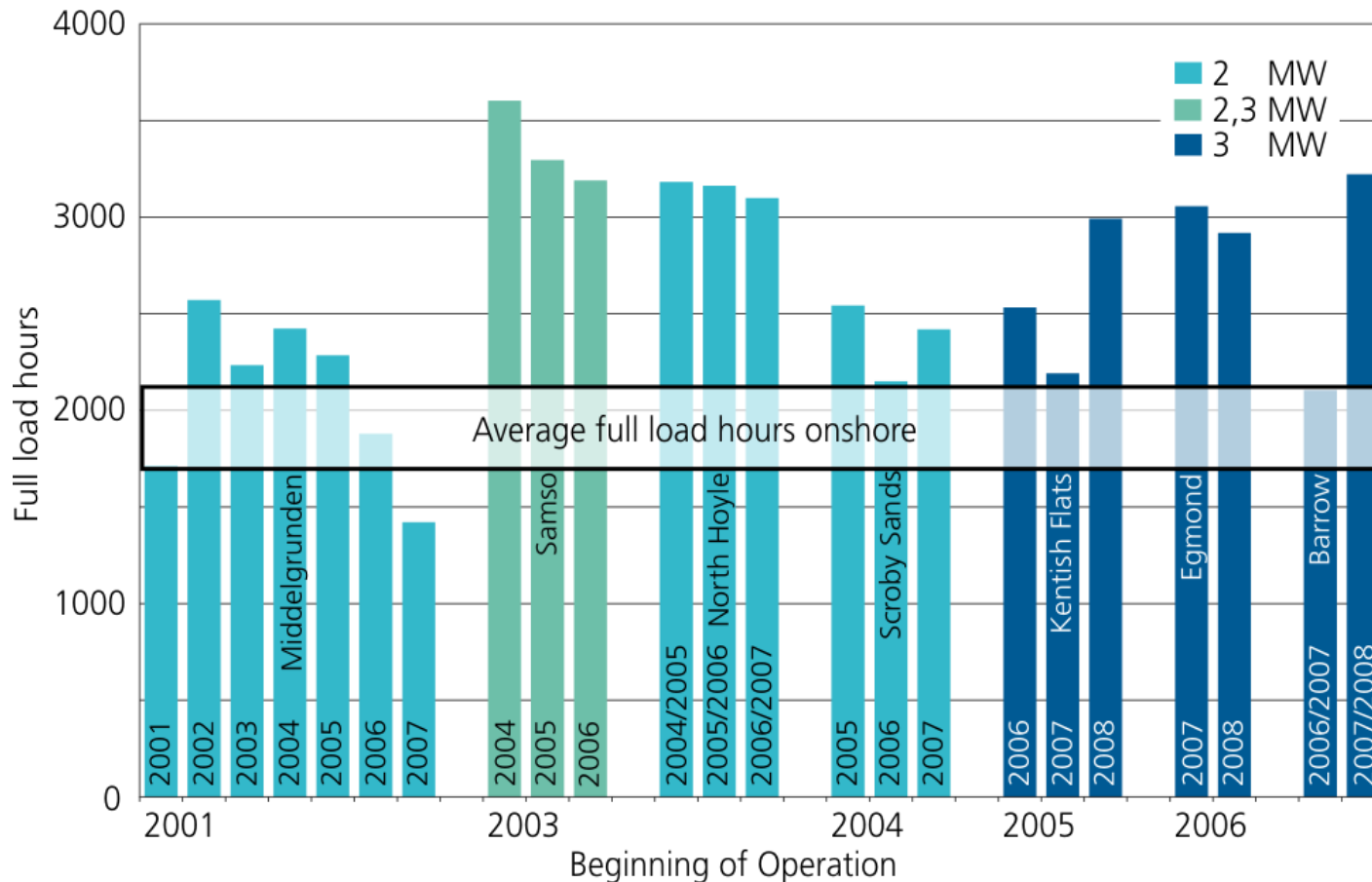
# First results

## ■ Comparison of on- and offshore availability



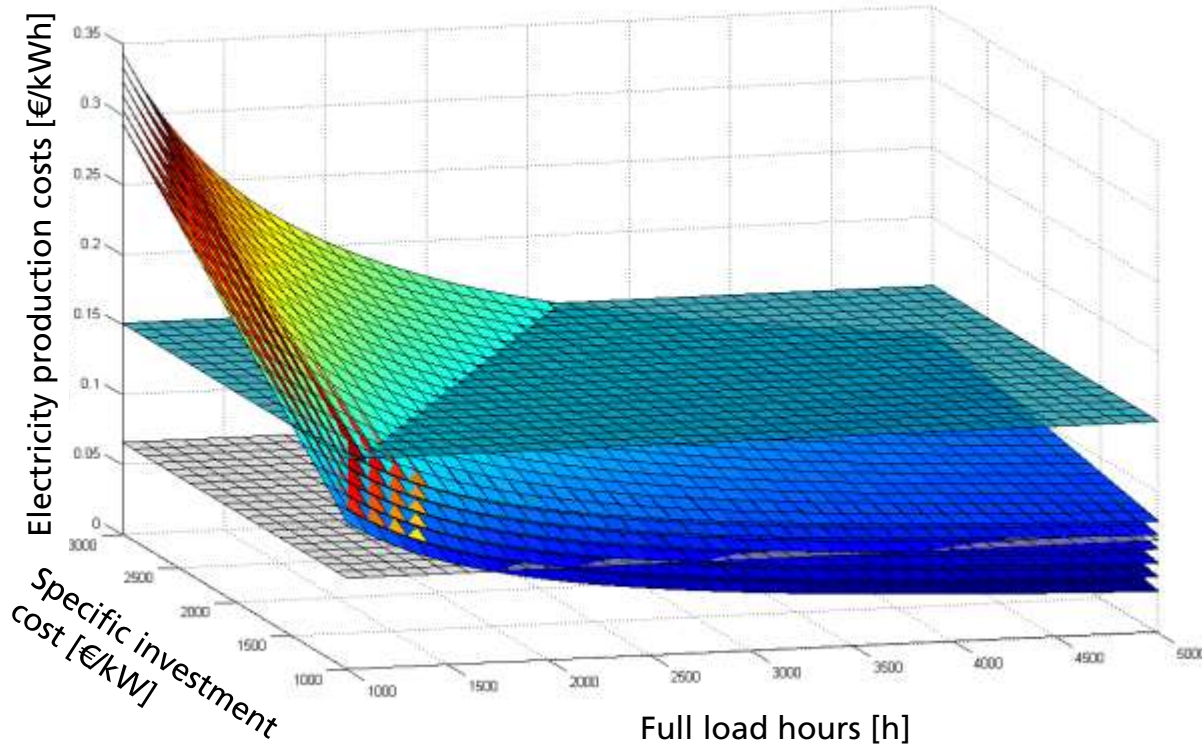
# First results

## ■ Comparison of on- and offshore full load hours



# First results

- Theoretical approach for electricity production costs



- Operating cost:  
1 ct€/kWh – 6 ct€/kWh

- Offshore remuneration [ct€/kWh]:  
Germany: ~15  
UK: ~18  
Denmark: ~6,9-8,4  
Belgium: ~13-14,7  
Ireland: ~14  
Sweden: ~6,76

# Conclusions

- Fraunhofer IWES has great experience with monitoring programs (WMEP)
- Offshore~WMEP is about to built up offshore data base
- Offshore development gather pace especially in Germany
- Offshore availability is still a critical factor → optimising design & construction and operation & maintenance
- New Wind Energy Report 2010 is available at stand 12281
- Further information at [www.windminitor.de](http://www.windminitor.de) and [www.offshoremep.iwes.fraunhofer.de](http://www.offshoremep.iwes.fraunhofer.de)



**Topical Expert Meeting (TEM) on**  
**INTERNATIONAL STATISTICAL ANALYSIS ON**  
**WIND TURBINE FAILURES**

March 30-31, 2011  
Fraunhofer Institute for Wind Energy and Energy System Technology (IWES)  
Kassel - Germany

1<sup>st</sup> Announcement

# RAVE

RESEARCH AT ALPHA VENTUS

Eine Forschungsinitiative des Bundesumweltministeriums

presents  
cutting edge results from  
offshore research  
at the

**RAVE International Conference**  
**May 8 – 10, 2012**  
**Bremerhaven, Germany**

Conference topics

- operation, measurement and coordination
- foundation and support structures
- turbine technology and monitoring
- grid integration
- ecology, safety and acceptance

Photo by: JGP 2011 - North Sea Breeze

Mark your diary!



Funding Body:



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RAVE Supervisor on behalf of BMU:



Coordinator:



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# *Thank you for your attention*

*Visit us at stand 12281*



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