THE GERMAN WIND TURBINE RELIABILITY DATABASE

WMEP

Wind Power R&D seminar – Deep sea offshore wind power
20-21 January 2011, Trondheim, Norway

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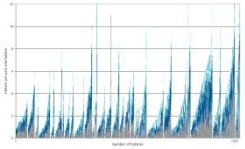
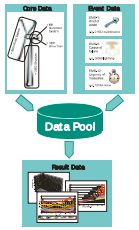
THE GERMAN WIND TURBINE RELIABILITY DATABASE

- Introduction
- WMEP
- Reliability of wind turbines
- Offshore~WMEP
- Conclusions





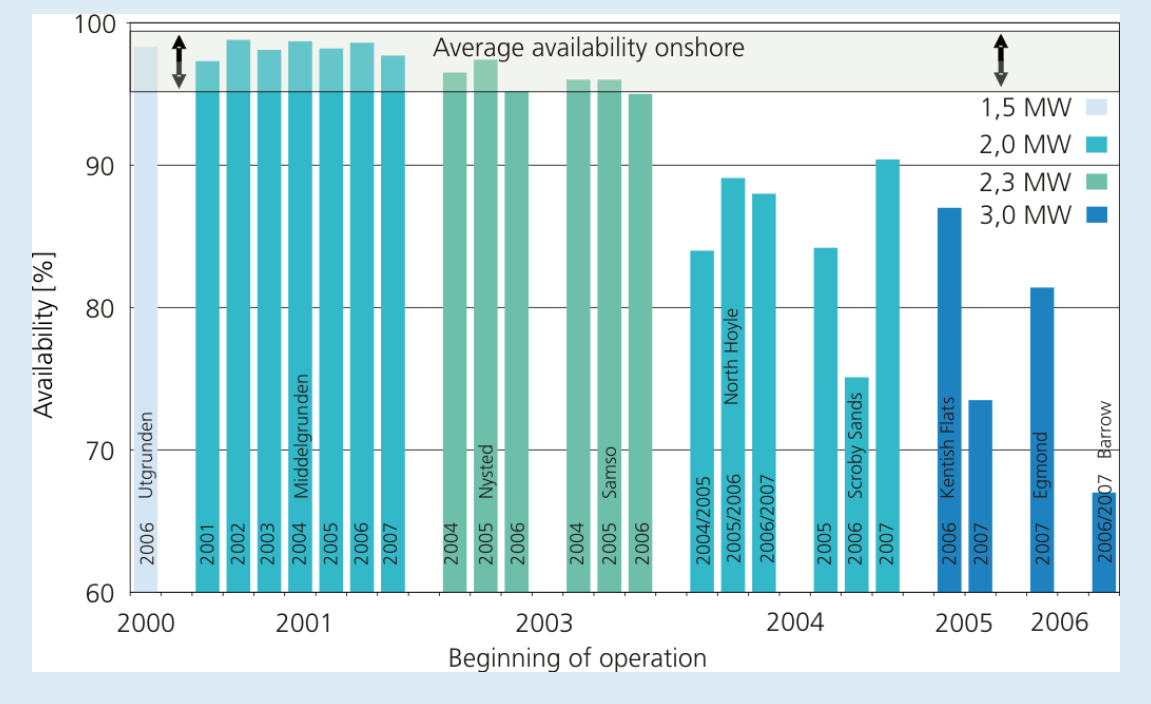
Introduction

Starting Point:

Modern wind turbines achieve high availability

Number of faults cause unplanned downtimes
➔ high maintenance efforts and costs

Offshore: drop of availability expected



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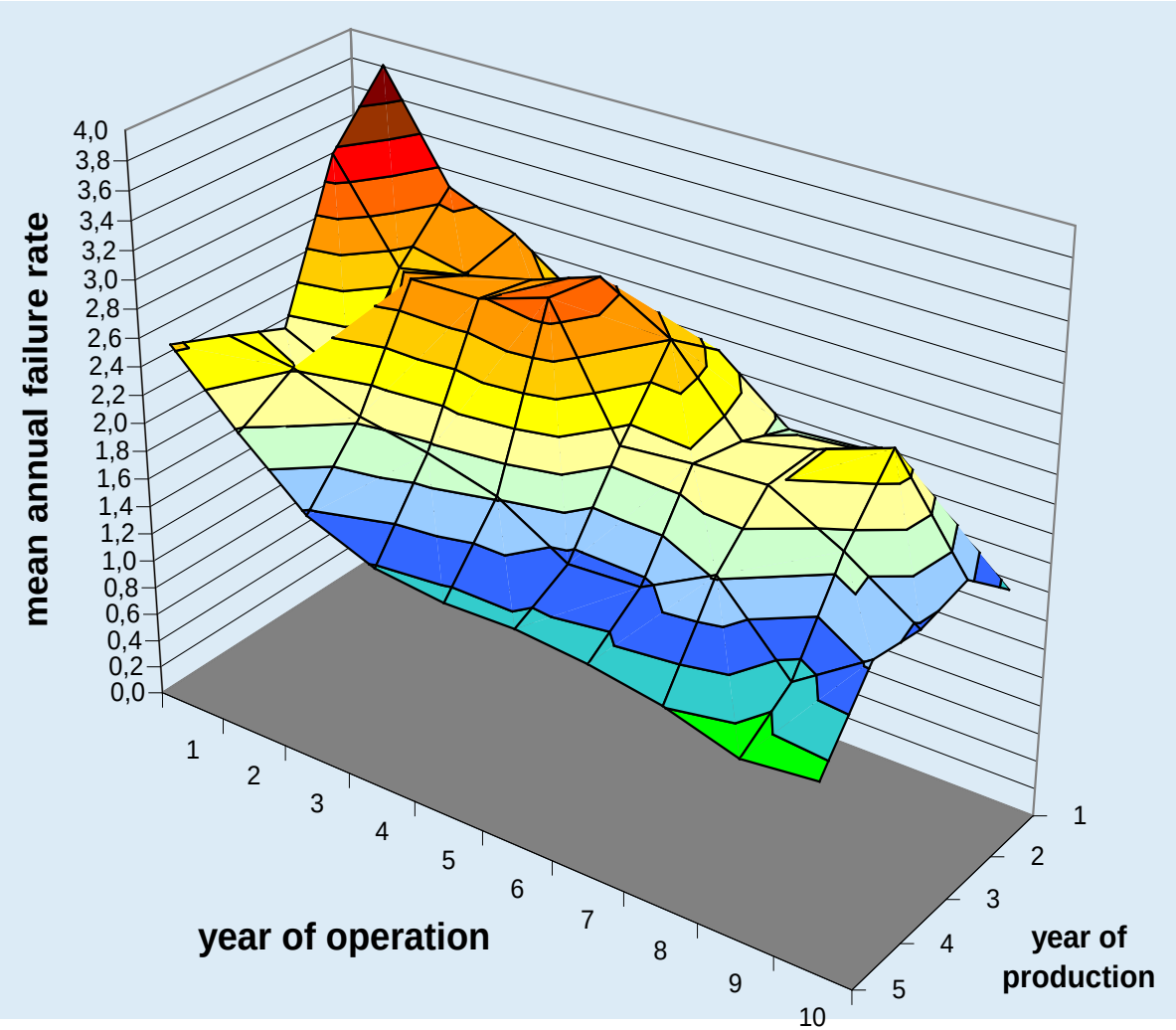
Introduction



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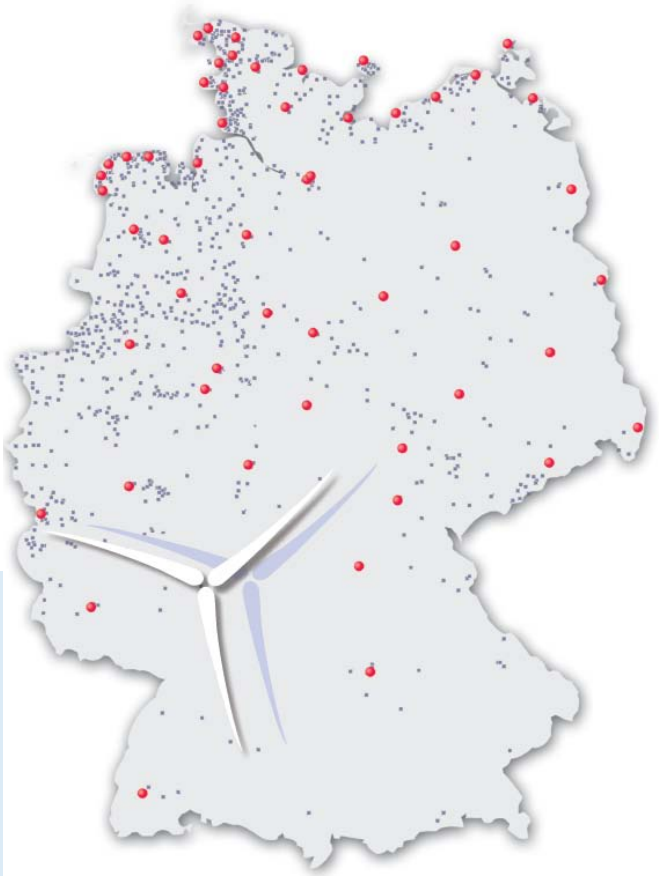
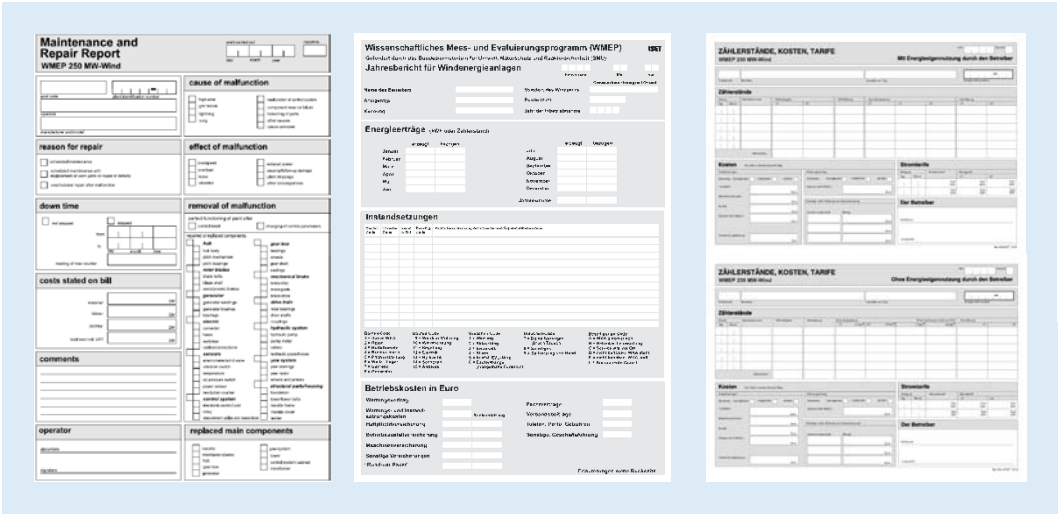
WMEP

Scientific Measurement and Evaluation programme WMEP

„ 250 MW Wind“ (1989-2006)

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





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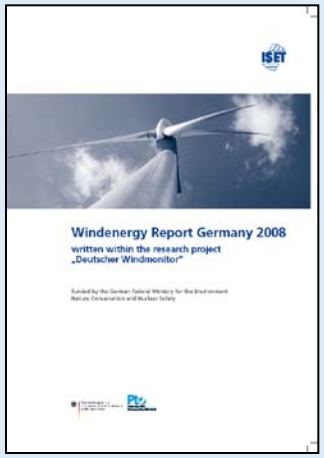
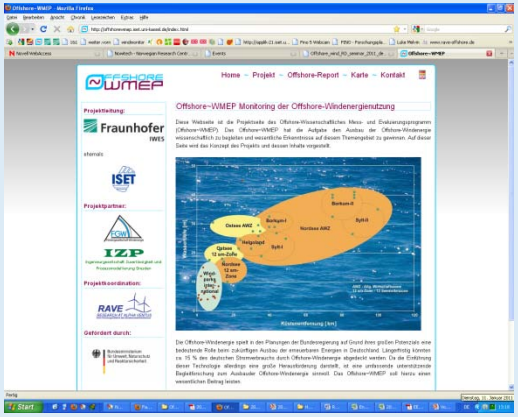
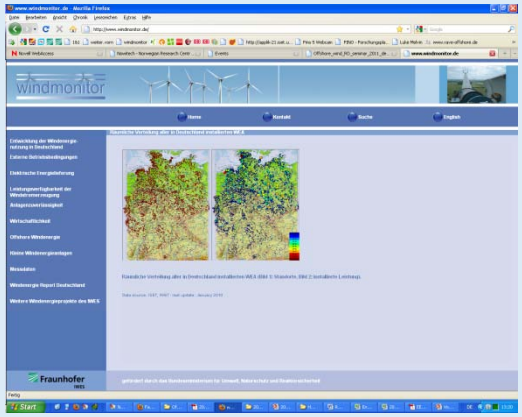
WMEP

Dissemination:

- Wind Energy Report (yearly published, 2010 coming soon)
- Internetportal
  www.windmonitor.de
- Project Homepage
  www.offshore-wmep.de



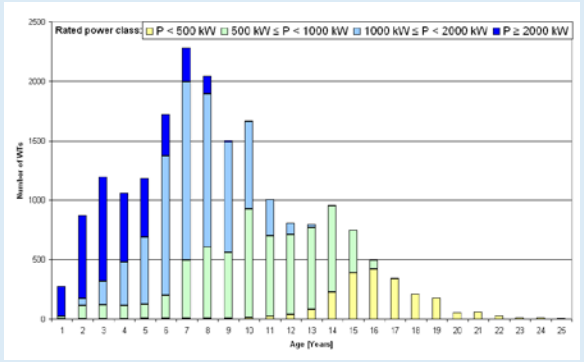


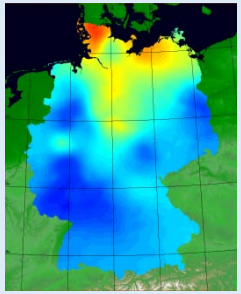


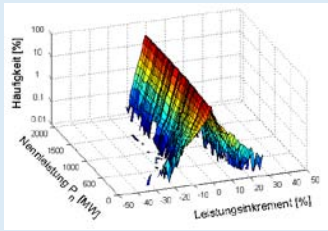
WMEP

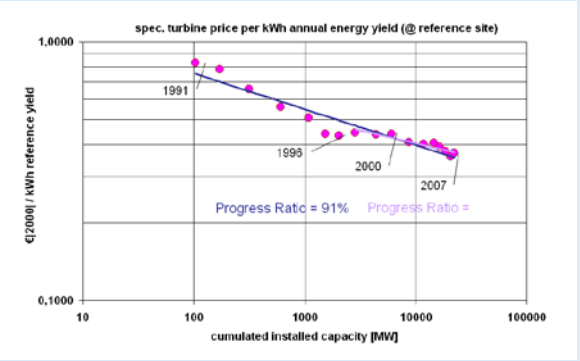
Research topics:

- Development and state of wind energy use
- Site & Turbine development
- External conditions
- Grid Integration
- Economics
- Reliability and availability









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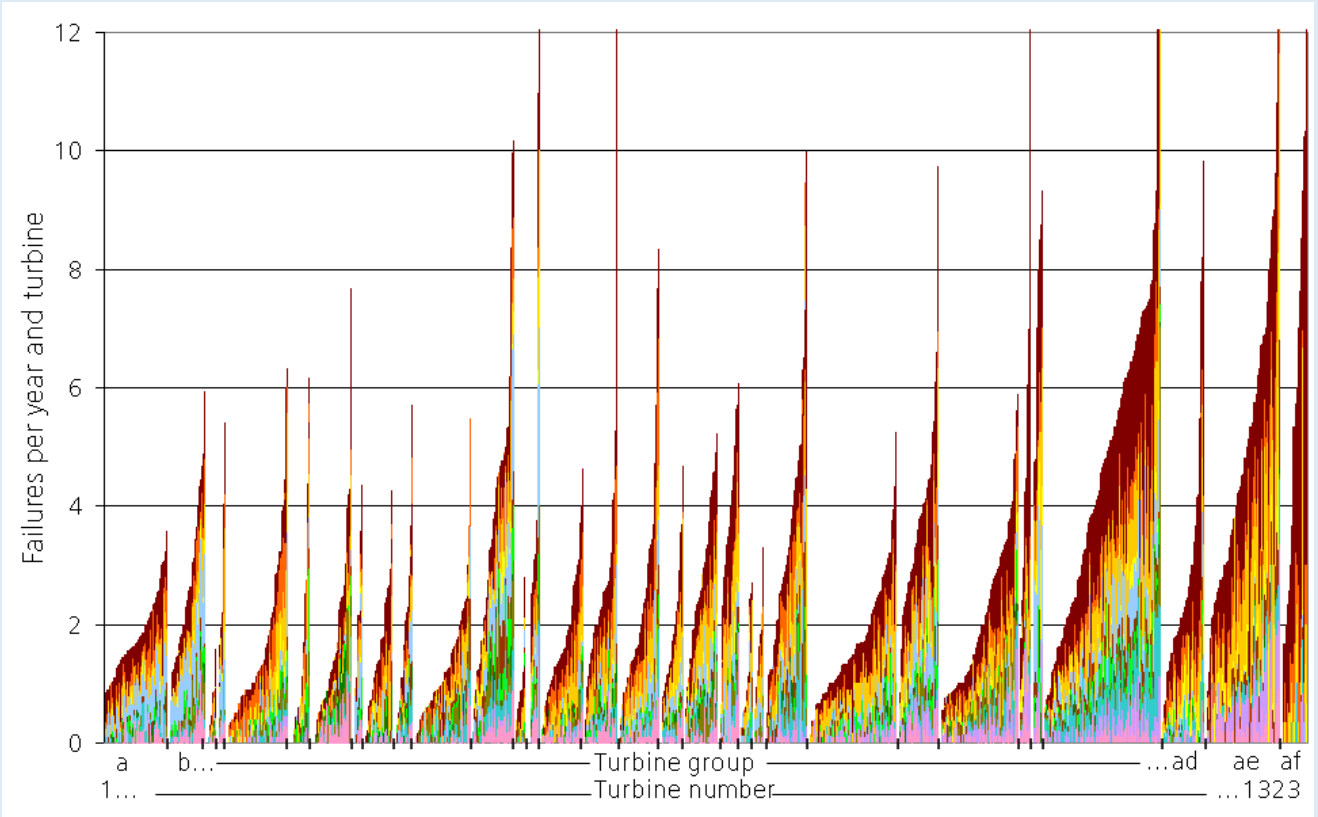
Reliability of wind turbines

$$\lambda = \frac{\sum n}{T}$$

n : number of failures

T : Time of operation

$$n = n(\text{failure cause};\ \text{Subassembly})$$



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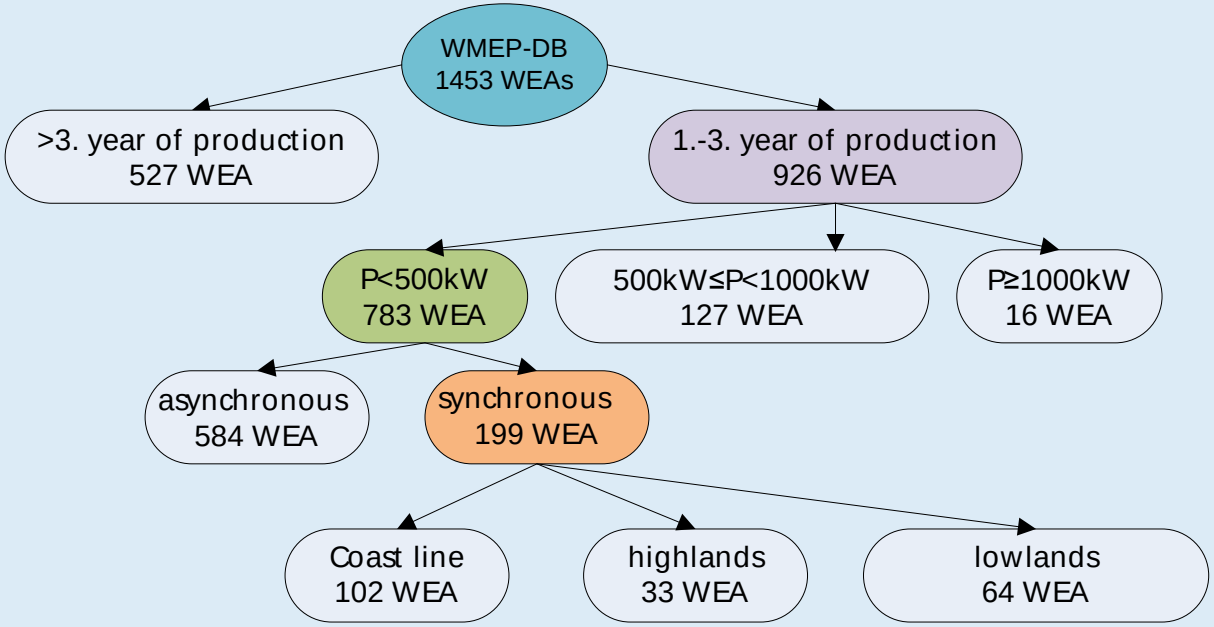
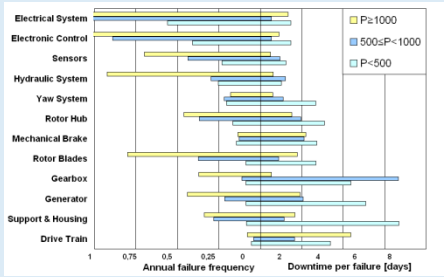
Appropriate Failure Statistics

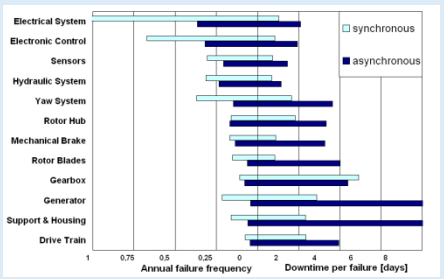
- For differential analysis distinctions regarding size, technical concepts, site conditions, etc. must be made

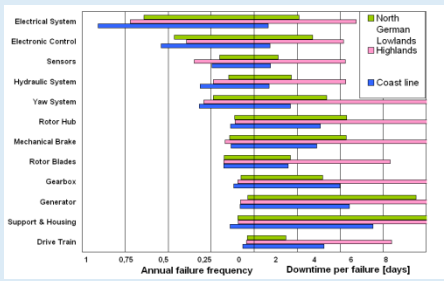


Turbine type???

Year of operation???







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Reliability based maintenance

Increasing availability:

➔ extending uptime

→ *increasing reliability of turbine and sub-assemblies*

➔ reducing downtime

→ *qualified maintenance*
→ *efficient strategies for spar parts*
→ *additional preventive measures*

Basis for reliability based maintenance is

- structured reliability characteristics
- validated maintenance costs

in consideration of operating conditions (reference values)

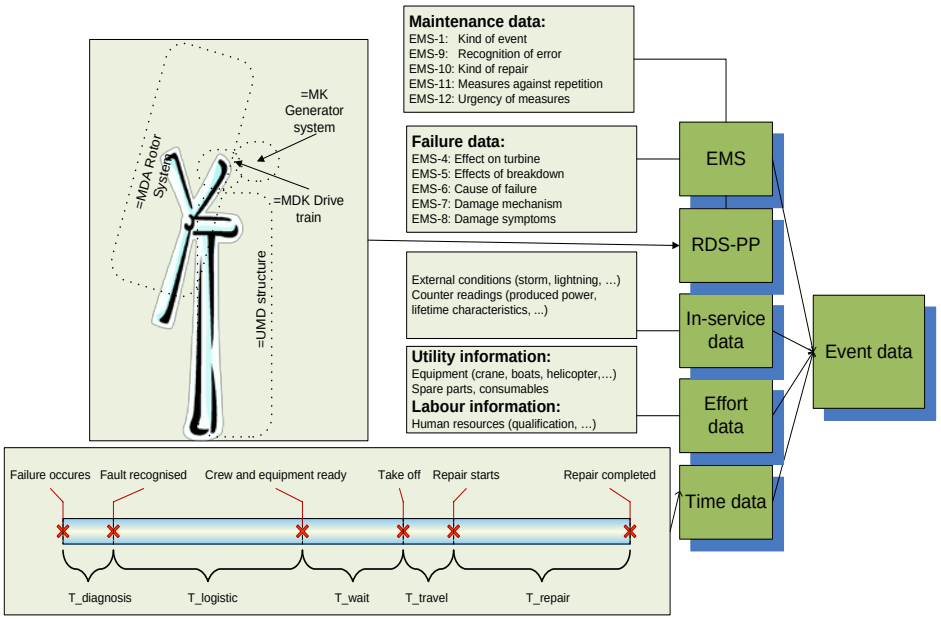
➔ Accurate and detailed documentation, consistent labelling of sub-assemblies, and unified description of events are needed

Appropriate Failure Statistics

For reliability based maintenance it is essential to know

- structured reliability characteristics
- validated maintenance costs

taking into account the operating conditions (reference values).



Thus,

- Accurate, detailed documentation
- Consistent naming of components
- Unified description of irregularities and activities

are needed.

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Offshore~WMEP

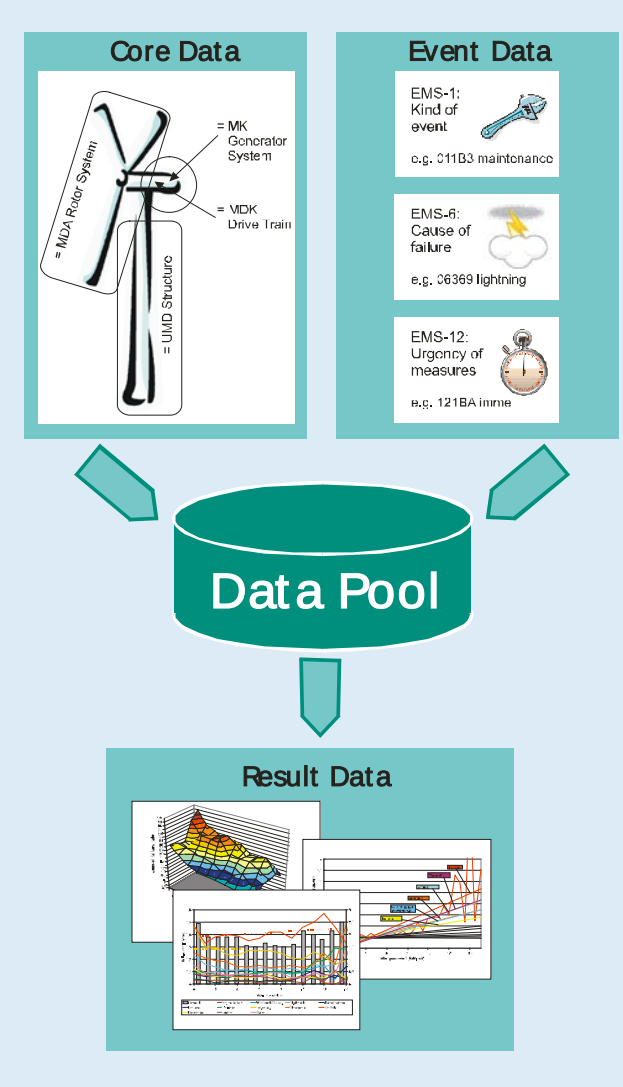
The generation of a common database

-aims to help in answering essential questions concerning offshore wind energy

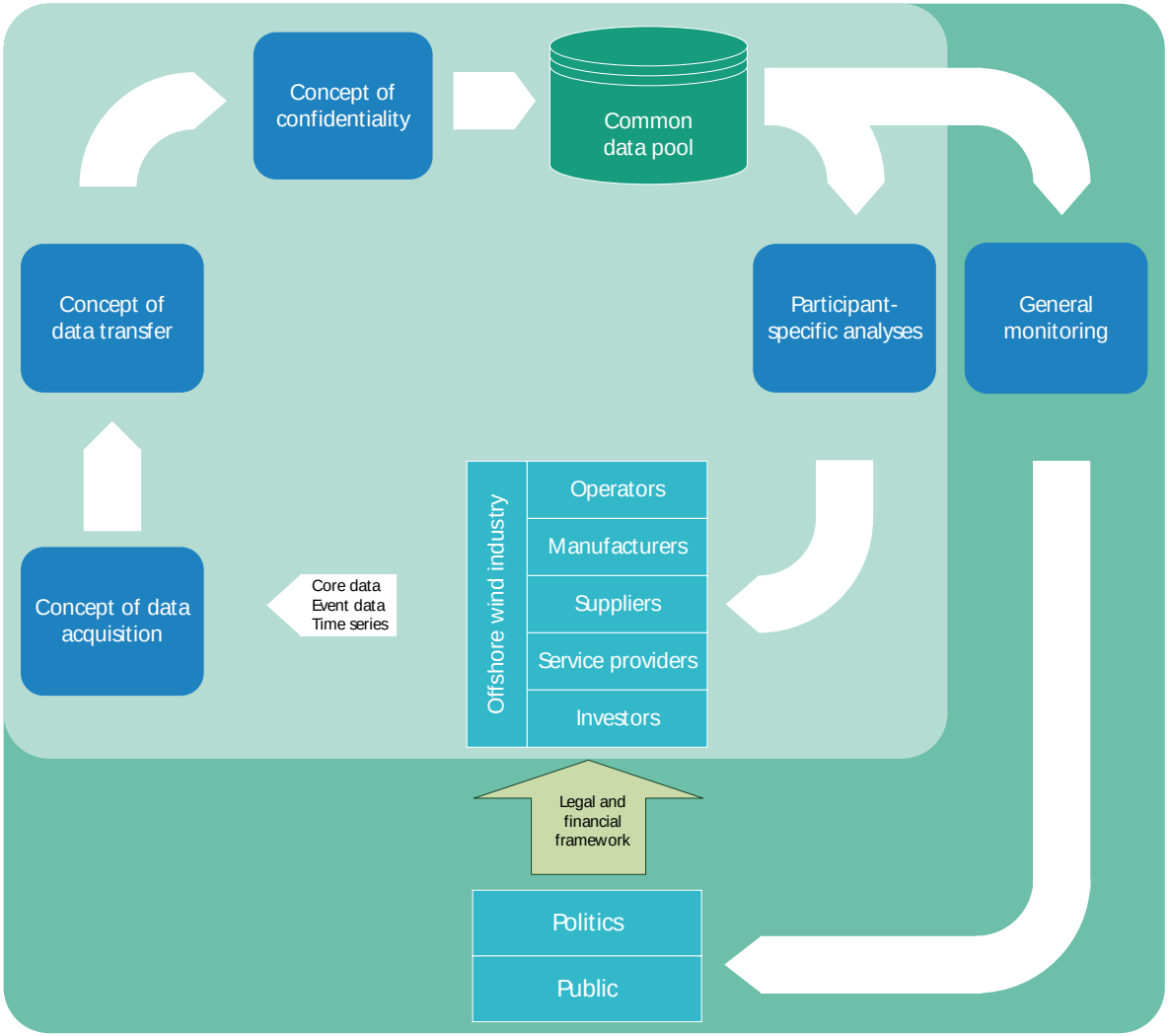
-contribute to political decision-making processes and facilitate further technological progress

-allows anonymous benchmarking and weak-point analyses

-gives the possibility to test and, if necessary, optimize the performance of offshore wind farms



Offshore~WMEP



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Conclusions

- Reliability and availability needs to get improved
- Experience is of great value for reliability and maintenance optimisation
- Already information available
  - level of detail needs to get improved
  - Statistic mass needs to be increased
    - ➔ Common database is proposed
      - Concepts (e.g. data base structure) established
      - Sharing of information has begun

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Thank you for your attention

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Reliability & Maintenance strategies
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