



## The Danish Test Facilities – Megavind Offspring

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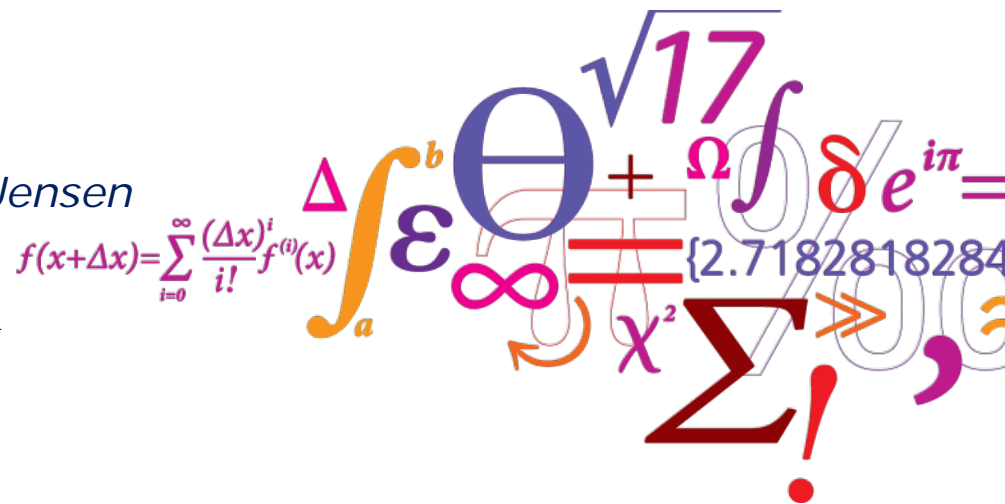
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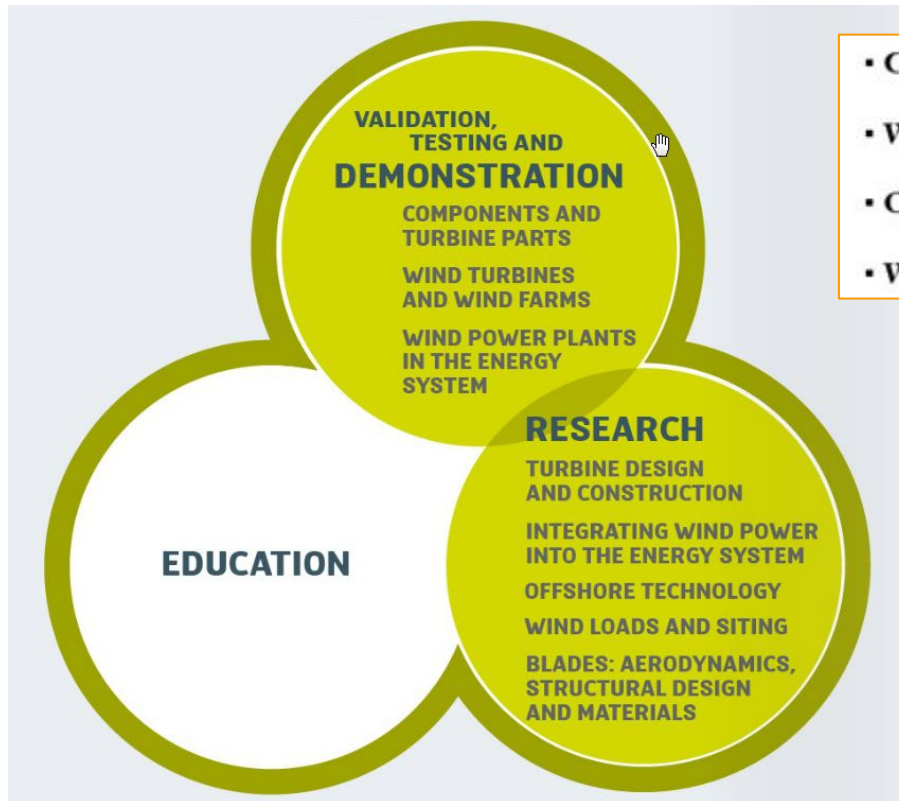
# The Danish Test Facilities – Megavind Offspring

## DTU Wind Energy

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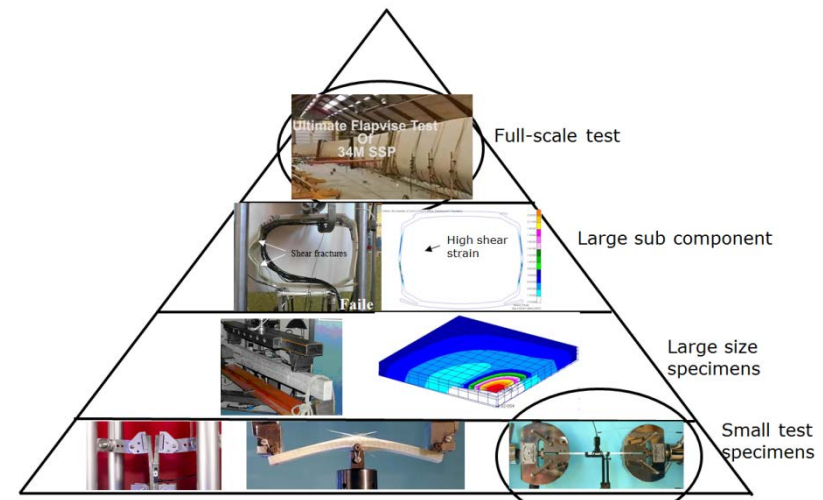
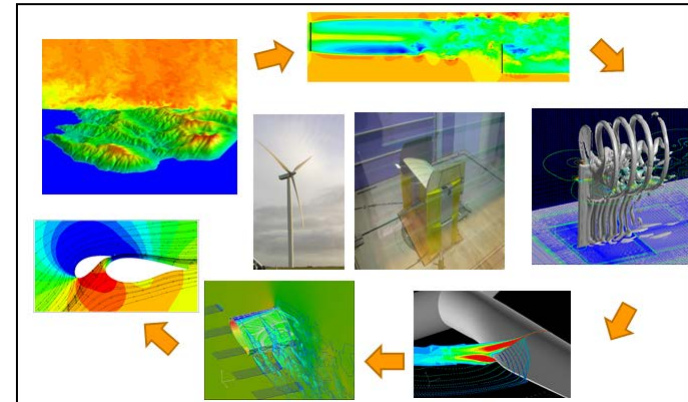
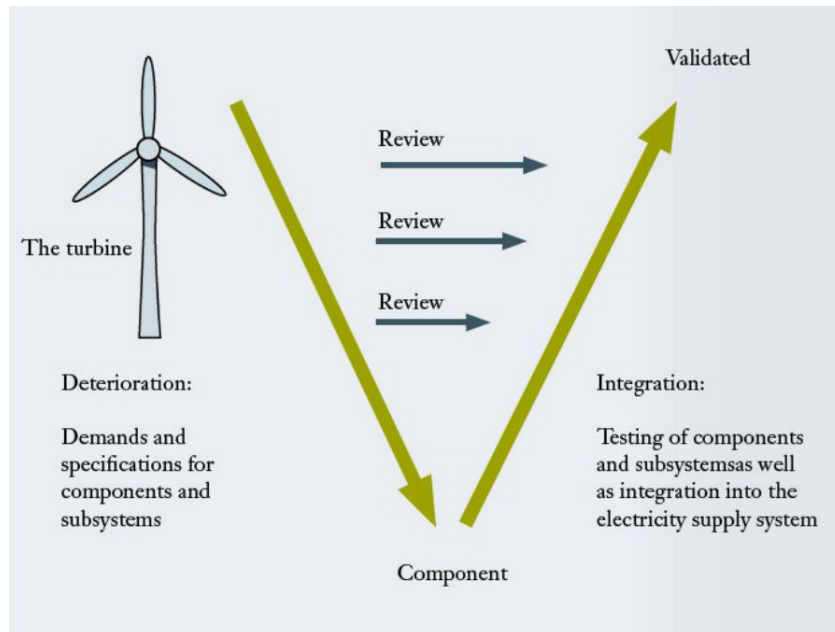


# Megavind 2007 - 2013



- Components and turbine parts
- Wind turbines (prototypes and pre-series) and wind power plants
- Offshore installations (e.g. foundations and grid)
- Wind power plants in the energy system

# Validation – Products and research



# Survey of test and research infrastructures

- **Existing and pipeline**

- Testcenter Østerild and Test Center for Large Wind Turbines at Høvsøre, DTU Wind Energy
- Blaest blade test facility and DTU Wind Energy static blade test facility
- LORC test facilities and DTU Wind Energy Drivetrain Test Facility
- Wind tunnel, DTU Wind Energy
- Grid test facility on Testcenter Østerild, DTU Wind Energy
- Computer Clusters, DTU Wind Energy
- Material and component tests (Hydraulic test bench – microscopes), DTU



- **Need for new research infrastructures, DTU**

- Research wind turbine Fatigue research blade test facility
- Research (acoustic) wind tunnel instrumentation
- Offshore wind conditions test equipment
- FiberLab (scale models, prototype components)



- **Need for new industry infrastructures**

- **More test sites** (Low wind, cold/warm climate, complex flows, duration)



# DTU Test Stations – Prototype Testing



Risø 1979



Høvsøre 2007

5 test beds  
 < 165 m  
 < 8 MW  
 Spacing 300 m

7 test beds  
 < 250 m  
 < 16 MW  
 Spacing 600 m



Østerild 2011

# Wind Turbines at Østerild

Stand (no)	Turbine Company (model)	Effect (MW)	Diameter (m)	Nac / Tip height (m)
1	<a href="http://www.WindTurbineTest.com">www.WindTurbineTest.com</a>		Tender:	28/6-2013
2	Vestas (in 2014)			
3	Vestas (in 2013)			
4	<a href="http://www.WindTurbineTest.com">www.WindTurbineTest.com</a>		Tender:	28/6-2013
5	Envision (in 2014)			
6	Siemens (SWT-6,0)	6,0	154	120 / 197
7	Siemens (SWT-4,0)	4,0	120	110 / 170

# Østerild Test Center

## Wind turbine testing:

- Tests acc. to international standards (IEC)
- Development tests

## Research:

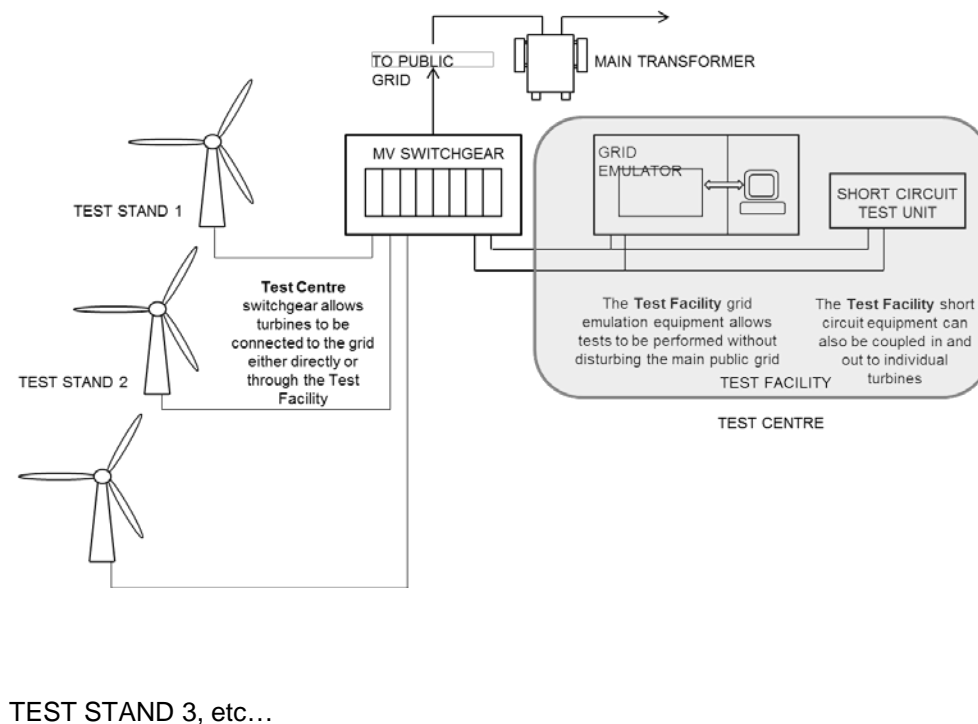
- Meteorology (Wind)
- Turbine technology
- Grid integration



Inauguration 6. Oct. 2012



# The DTU Wind Energy Moveable Grid Test Facility: Overall schematic



Test facility supports test of wind turbines with rated power  $P_n < 10\text{MW}$ . Two types of equipment included in the Test Facility:

- 1) Short circuit equipment
  - only applicable to LVRT tests,
  - required by most TSOs today
  
- 2) Power converter equipment
  - net emulation which enables tests of wind turbine response to a variety of grid conditions, including system services like primary frequency control and virtual inertia

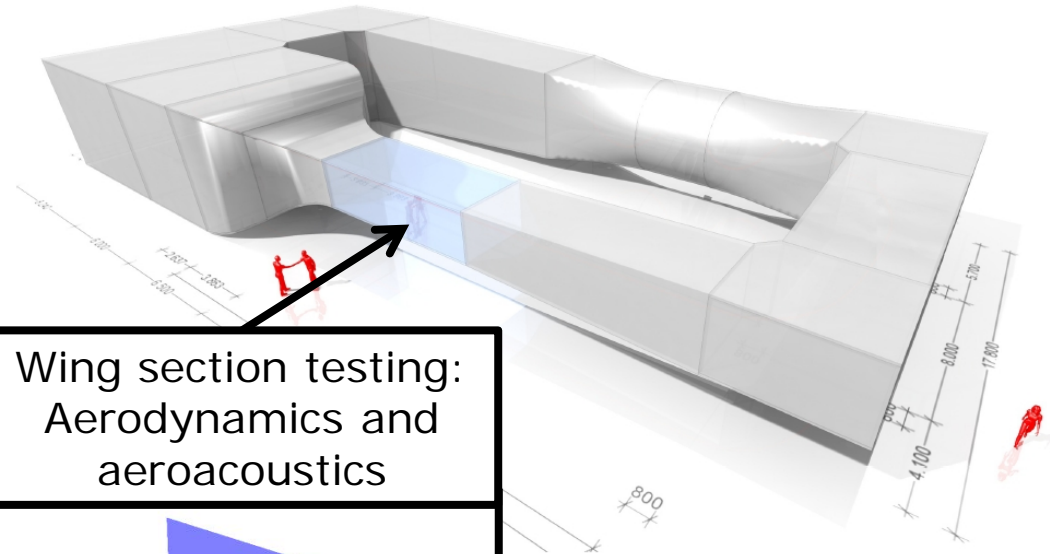
# Blaest Blade test facility and DTU Wind Energy Blade Test Facility

DTU Wind Energy

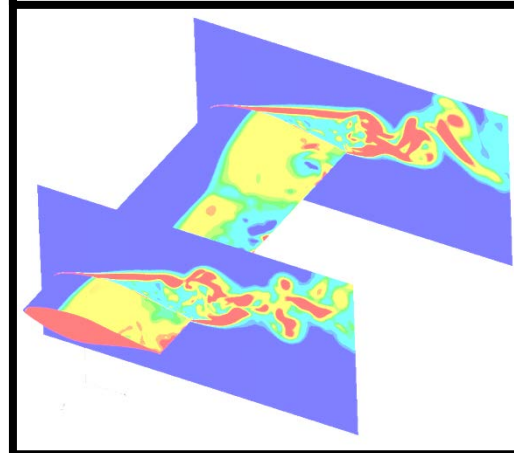
## Blaest



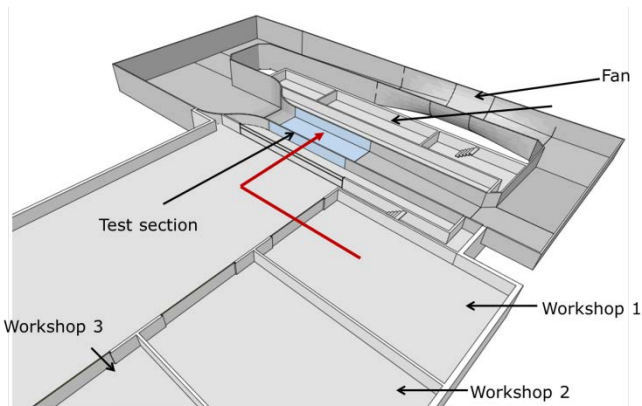
# The Danish National Wind Tunnel Dedicated for wind turbine testing



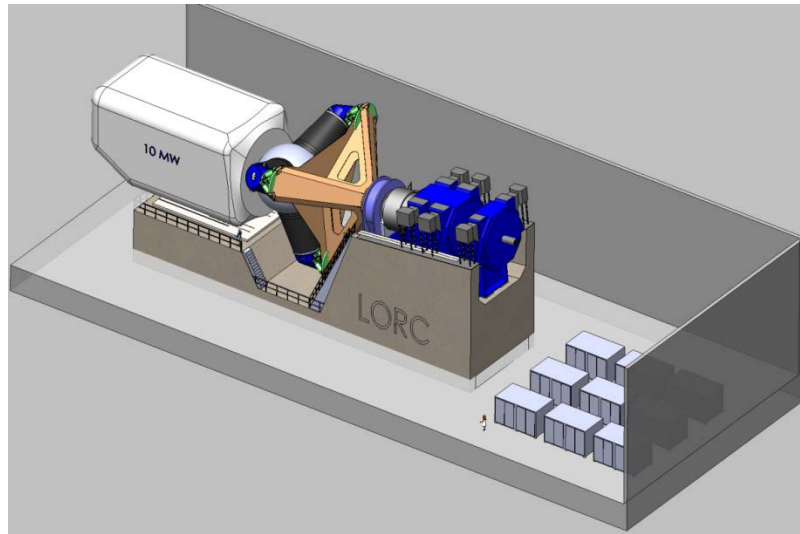
Wing section testing:  
Aerodynamics and  
aeroacoustics



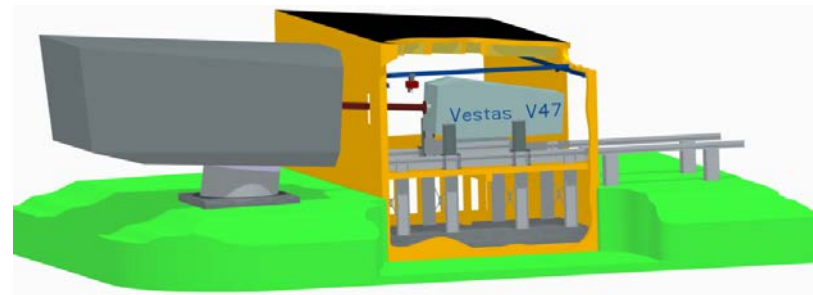
Efficient workflow



# Drivetrain test facilities at LORC and DTU Wind Energy



## DTU Wind Energy



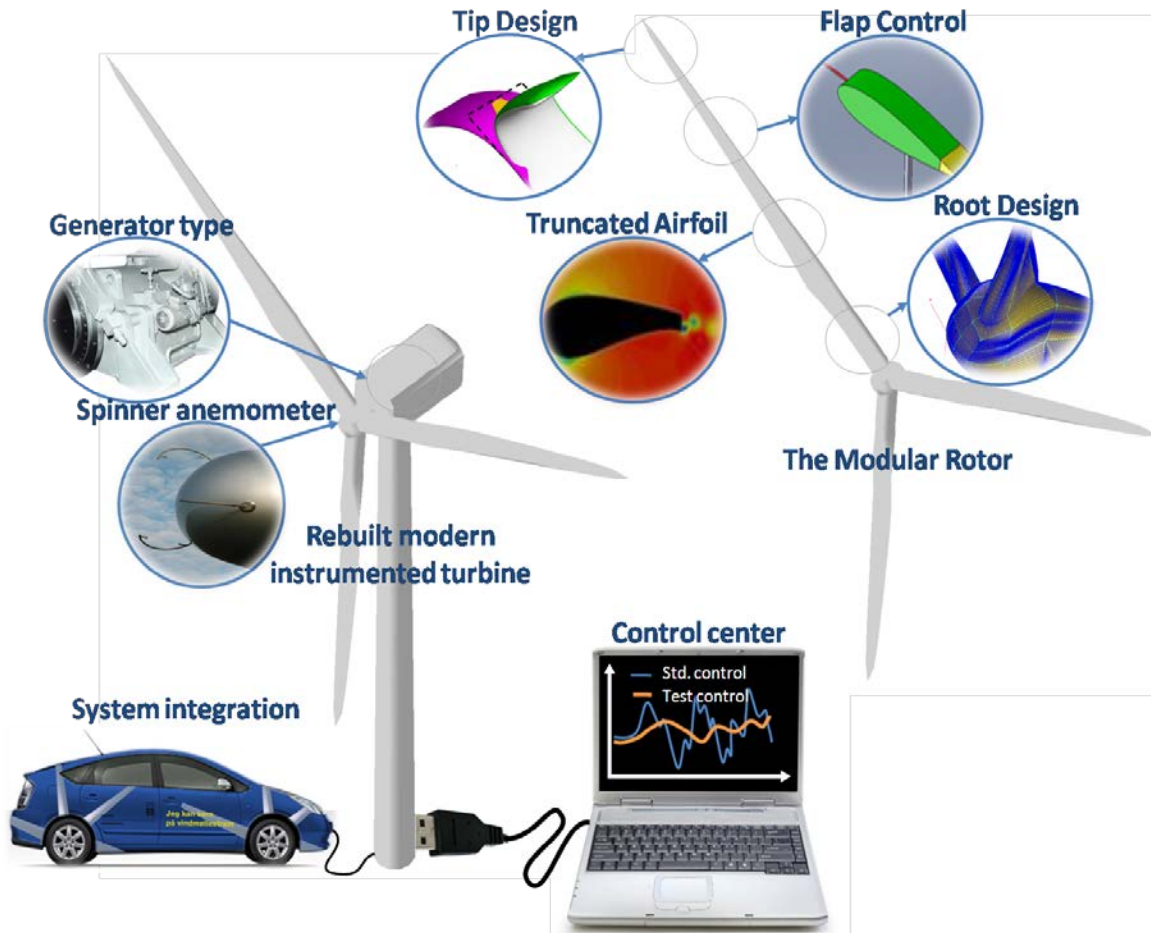
# Need for research infrastructures at DTU

## Wind Energy



- Research wind turbine at DTU wind energy
- Fatigue research blade test facility
- Research instrumentation of new Wind tunnel
- Offshore wind conditions test equipment
- FiberLab

# Research Wind Turbine, DTU Wind Energy





**Thank you for your attention**