FORSCHUNGSPARK WINDENERGIE – WIVALDI

EFFIZIENZSTEIGERUNG – WIE SEHEN EFFIZIENTE, LEISE UND KOSTENGÜNSTIGE WINDENERGIEANLAGEN DER ZUKUNFT AUS?

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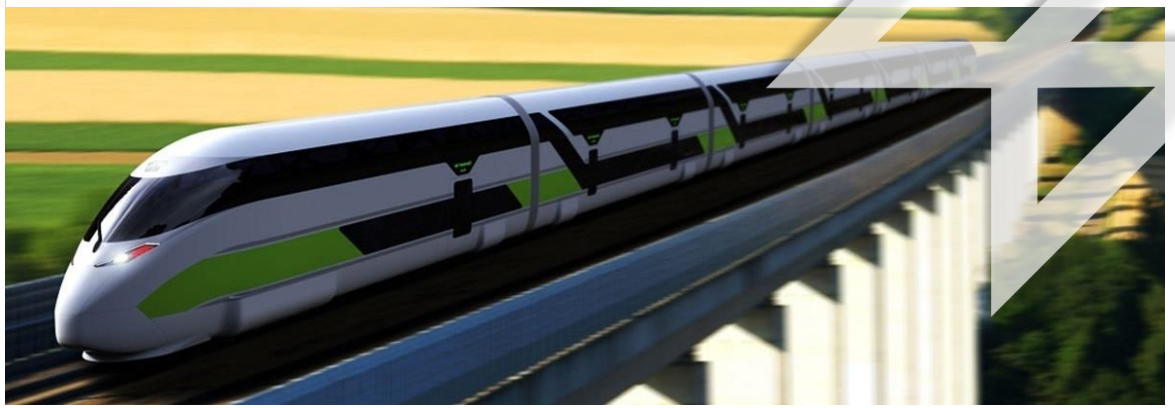
DLR

DLR at a glance

Aeronautics

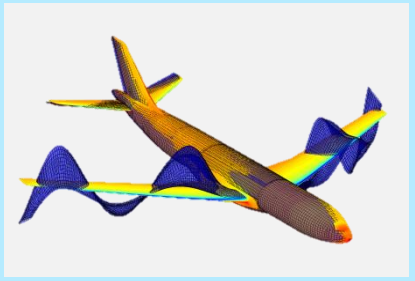
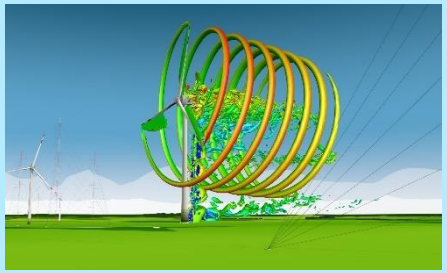
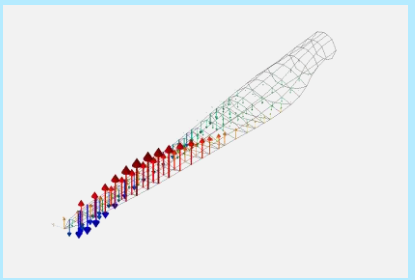
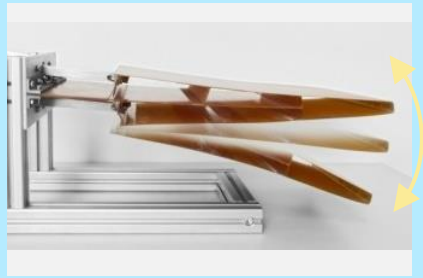
Space research and technology

Transport



Energy

Synergies: aerospace and wind energy research @ DLR

	Aeroacoustics	Aerodynamics	Atmospheric Physics	Aeroelasticity	Composite Structures and Adaptive Systems
Aerospace					
Wind Energy					

Large-scale research facilities @ DLR

Test systems and simulators

Solar thermal plant

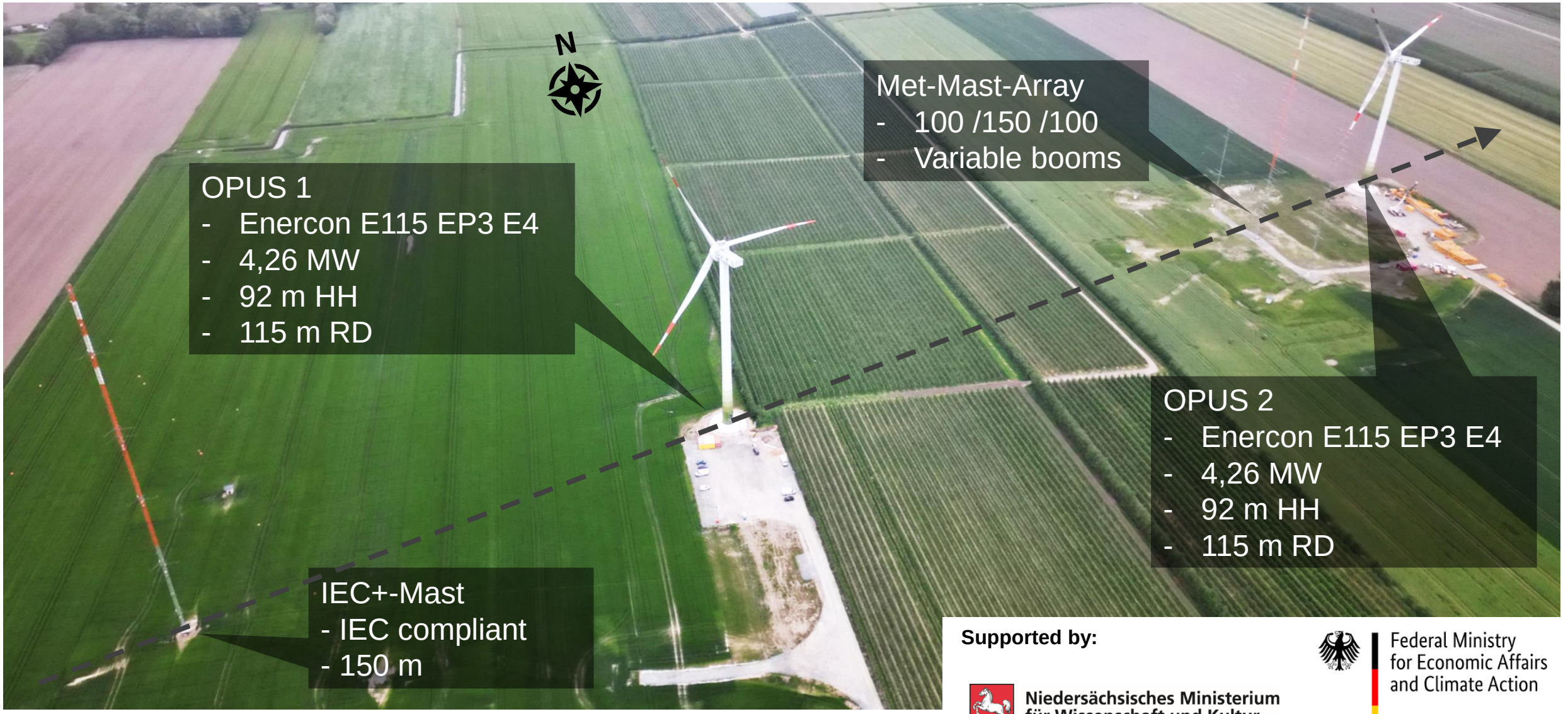
German Antarctic Receiving Station (O’Higgins)

Research aircarfts

WiValdi – Research Wind Farm

Research Alliance Wind Energy

DLR



Supported by:

Niedersächsisches Ministerium für Wissenschaft und Kultur

Federal Ministry for Economic Affairs and Climate Action

OPUS 1&2

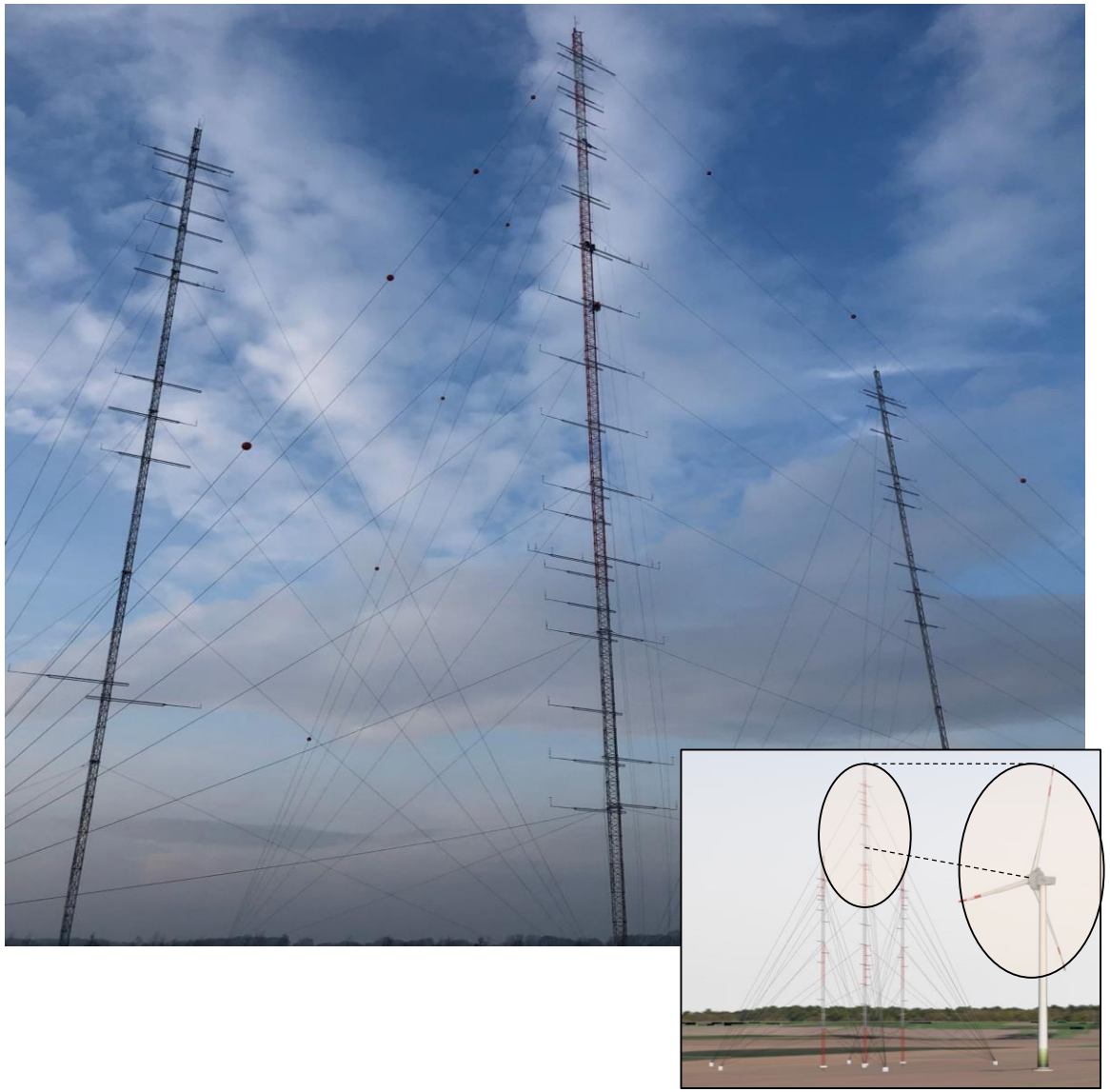
(total installed sensors OPUS 1: 1225 / OPUS 2: 689)

Sensor type	QTY
Foundation (total)	**229**
Inclinometer	
Electrical strain gauges	
Electrical displacement sensors	
Fiber optic strain and temperature	
Tower (total)	**167**
Electrical acceleration sensors	
Electrical strain sensors	
Electric strain gauges	
Electrical temperature sensors	
Pressure measuring belt	
Nacelle & azimuth (total)	**42**
Electrical acceleration sensors	
Electrical strain gauges	
Power meter	
Rotary encoder	
Electrical temperature sensors	
Current clamp meters	

Sensor type	QTY
Generator (total)	**95**
Electrical acceleration sensors	
Electrical strain gauges	
Air gap sensors	
Electrical temperature sensors	
Grease sensors	
Rotor (total)	**1381**
Electrical acceleration sensors	
Electrical strain gauges	
Torque measuring shafts	
Electrical temperature sensors	
Distance sensor	
Fiber optic strain sensors, Fiber optic acceleration sensors	
DuraAct surface converters	
DIC marker system	
Lidar (spinner)	

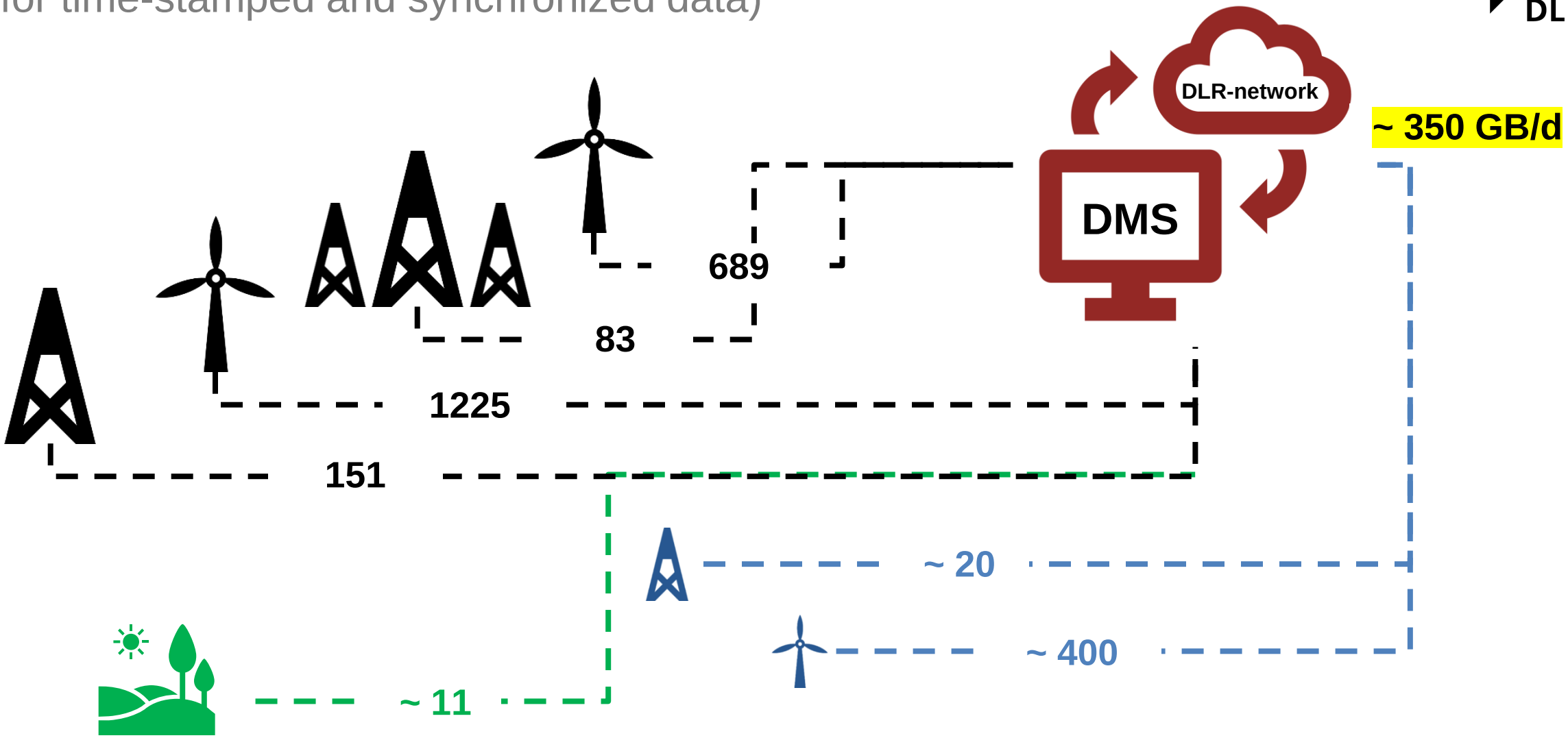
Meteorological masts
(total installed sensors 234)

Sensor type	QTY
IECplus-Mast	**151**
Electrical acceleration sensors	
Cup anemometer	
Wind vane	
Air pressure sensor	
Thermo/hygro sensor	
Rainfall monitor	
Ultrasonic anemometer	
Gas analyzer	
Temperature difference sensor	
Tension force transducer	
Mast Array (total)	**83**
Cup anemometer	
Ultrasonic anemometer	

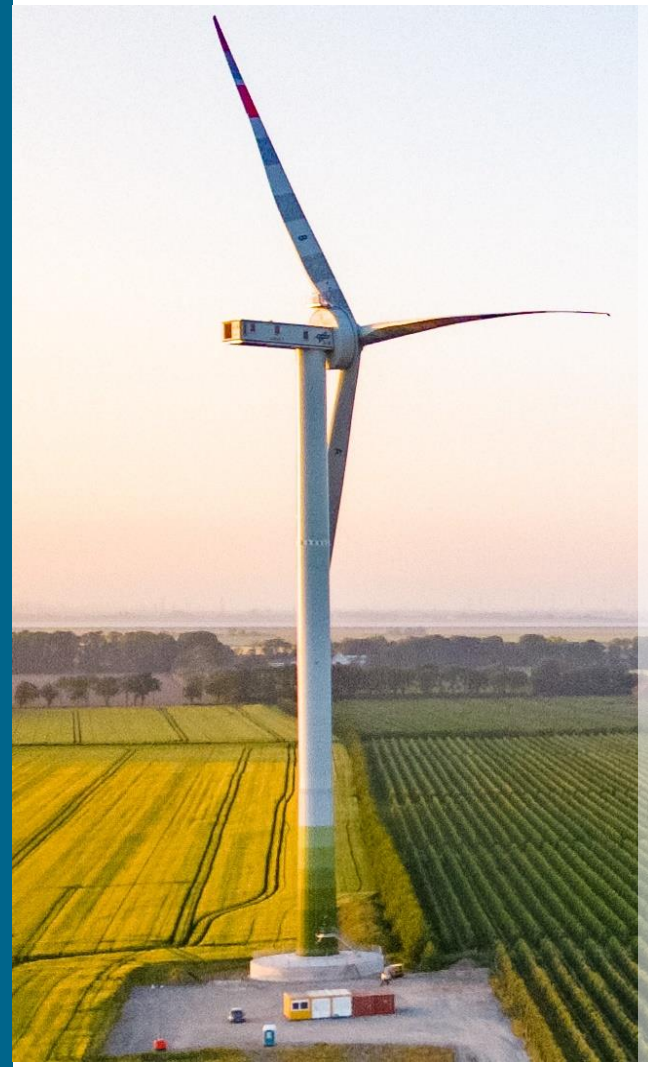


WiValdi – Data management system

(for time-stamped and synchronized data)

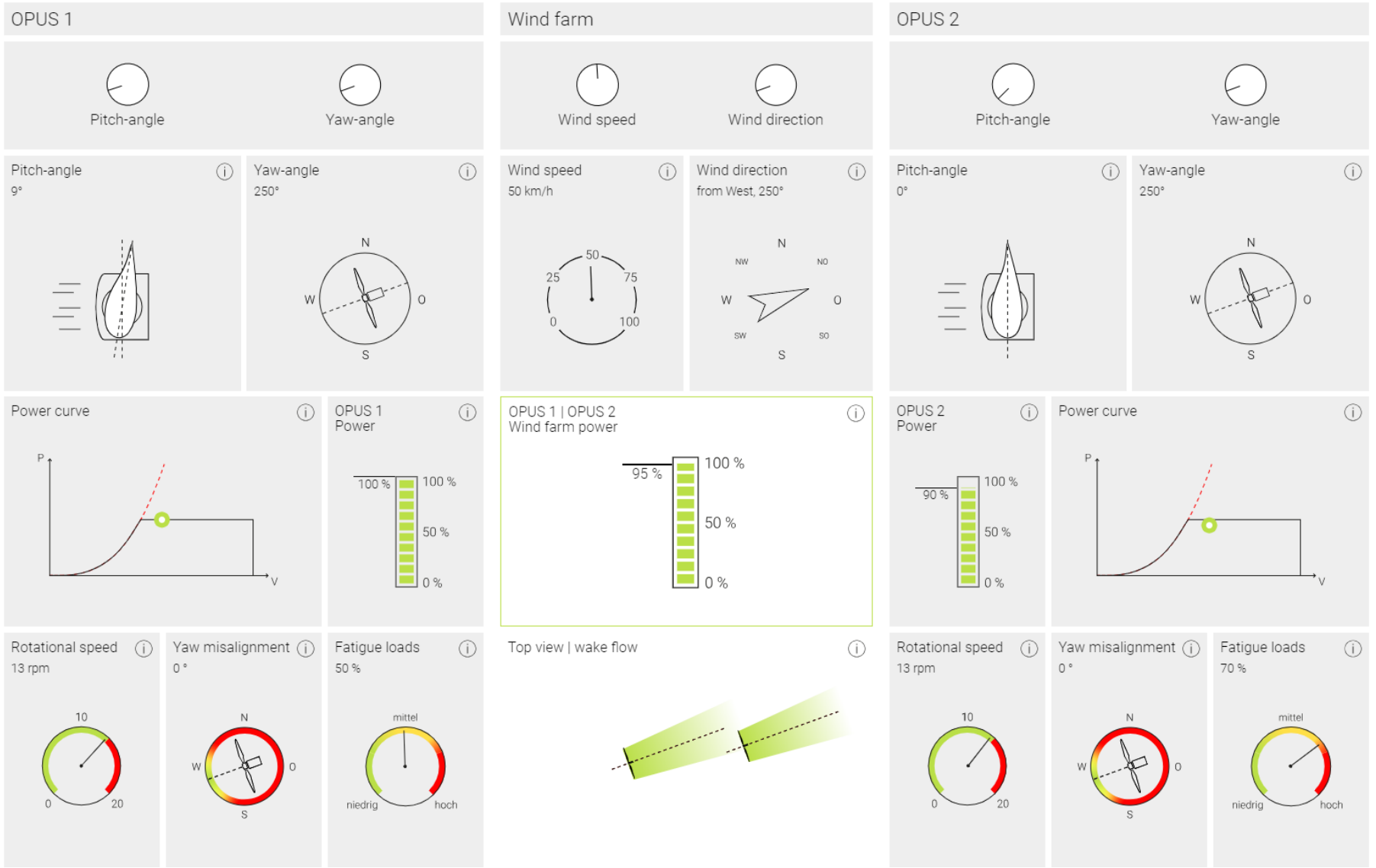


WiValdi – (selcted) research goals
(e.g. efficiency)

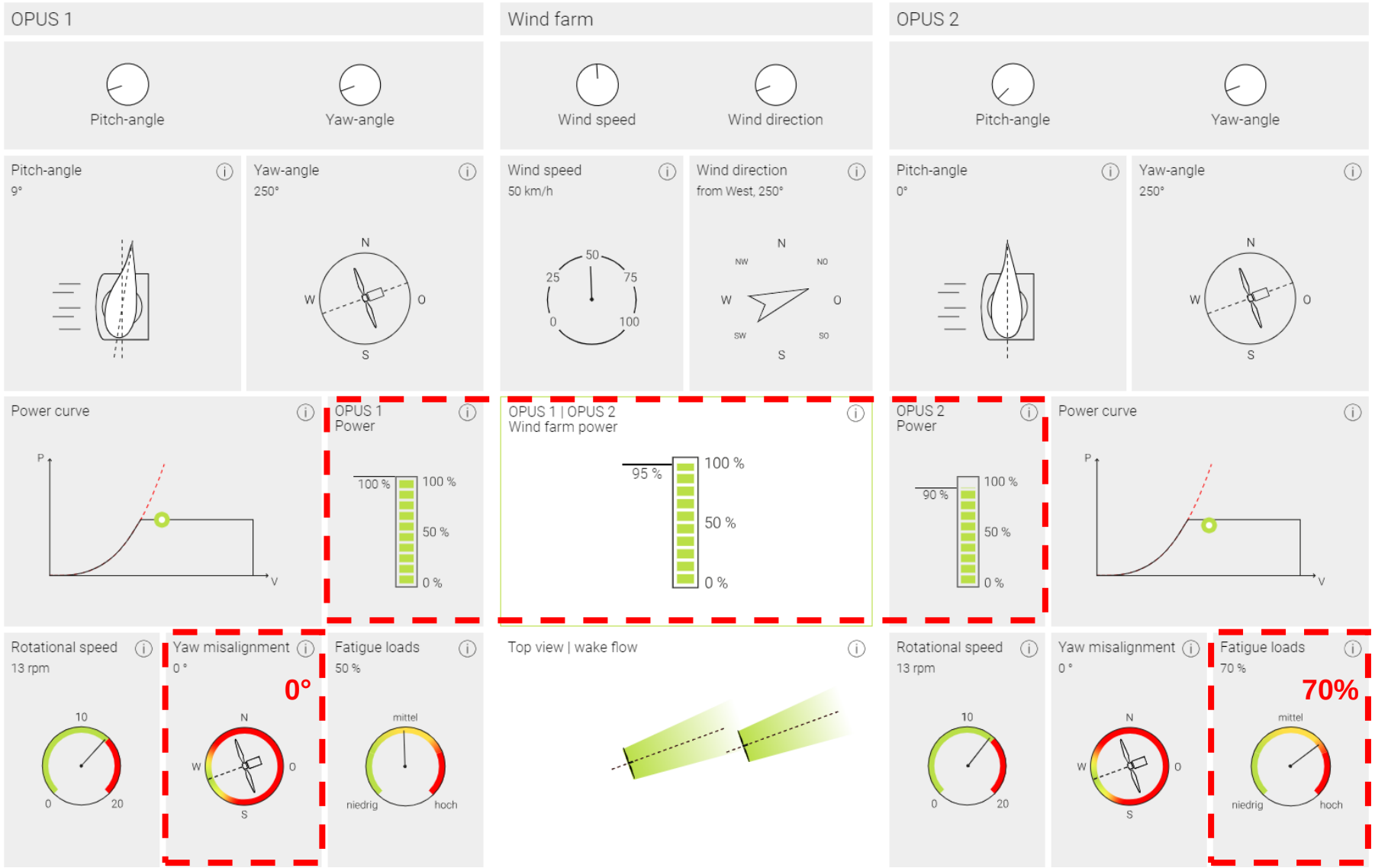


Investigation of wake effects

- “front” WTG faces undisturbed wind resources
- turbulent air flow hits “leeward” WTG
  → lower power & higher fatigue loads
- investigation of loads for efficient use of space
- research of potentials in
  - modes of operation → team play of WTG in farm-configuration
  - life extension & maintenance processes



https://windenergy-researchfarm.com/virtual-control-center/simulation



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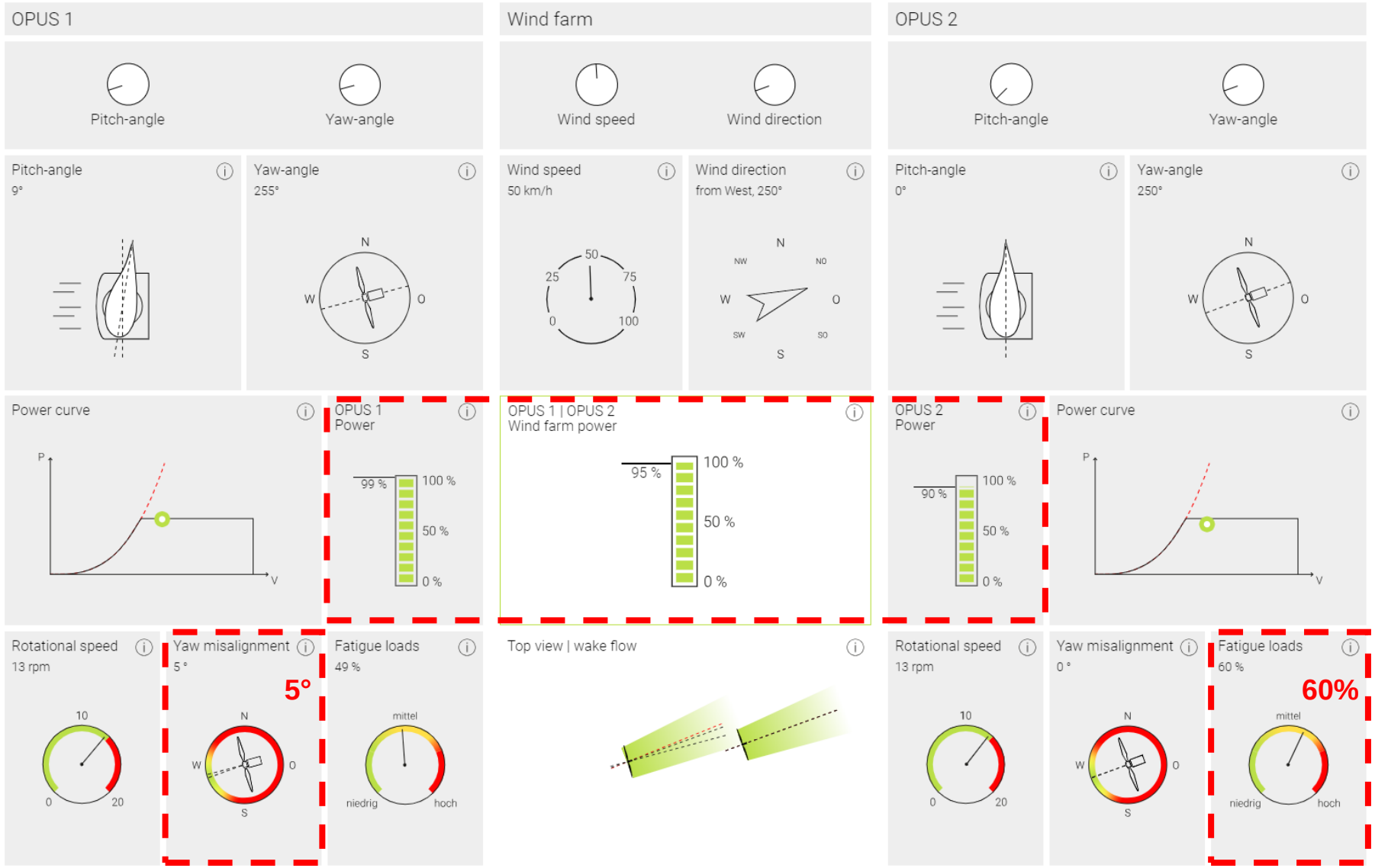
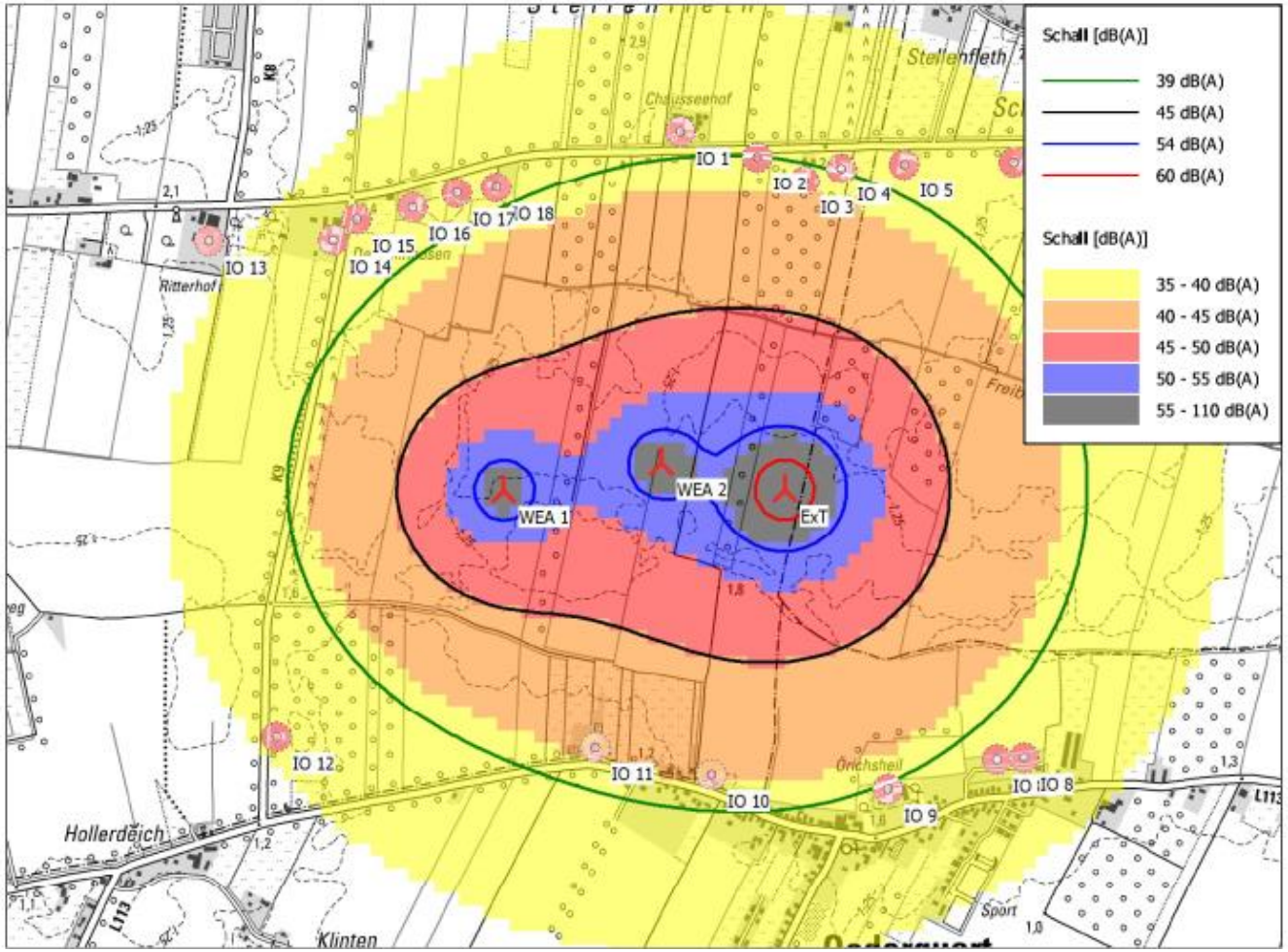


https://windenergy-researchfarm.com/virtual-control-center/simulation

WiValdi – (selcted) research goals
(e.g. noise)

Investigation of noise (emission, transmission, immission)

- for sustainable progress on social challenges
- efficient use of limited space for wind energy
- acceptance issues
- modeling and measurement of noise emission, transmission and immission
- suitable characterization for regulation issues
- coupling of wind energy with storage and grid for delivering energy on system demand



Effizienzsteigerung – Wie sehen effiziente, leise und kostengünstige Windenergieanlagen der Zukunft aus?

- Stellen wir uns die richtigen Fragen?
  - Fokus auf WEA / WEA im Park / Park (gesamte Erzeugung)
- Effizienz
  - „Quantensprünge“ (wie die letzten Jahrzehnte) unwahrscheinlich
  - Die WEA sind smart, aber egoistisch
- Schall (Lärm)
  - Emission, Transmission, Immission?
  - Technische Entwicklungen in Arbeit (Synergie mit Luftfahrtforschung)
- Kosten
  - CAPEX vs. OPEX (z.B.: Wartung durch lastoptimierten Betrieb)

WiValdi is open…

- **for collaboration**
- **for academia and industry partners**
- **to the field of wind energy research and beyond**

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www.windenergy-researchfarm.com