Optical-Thermal Video Data Fusion for Near Real-time Non-contact Blade Damage Detection in Spinning Wind Turbines

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Outline

- Motivation
- Advanced blade inspection: AQUADA
  - Full-scale blade testing
- AQUADA-GO for field application
  - AI model
  - Field testing and demonstration
- Concluding remarks

Motivation

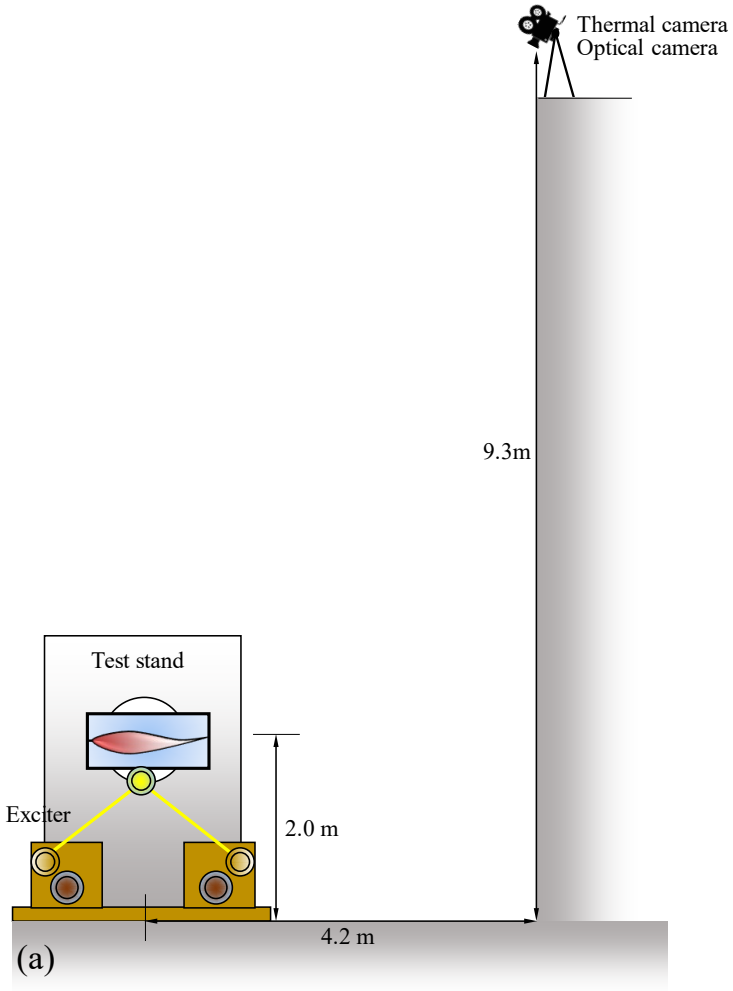
Blade inspection annually or every 6 months!

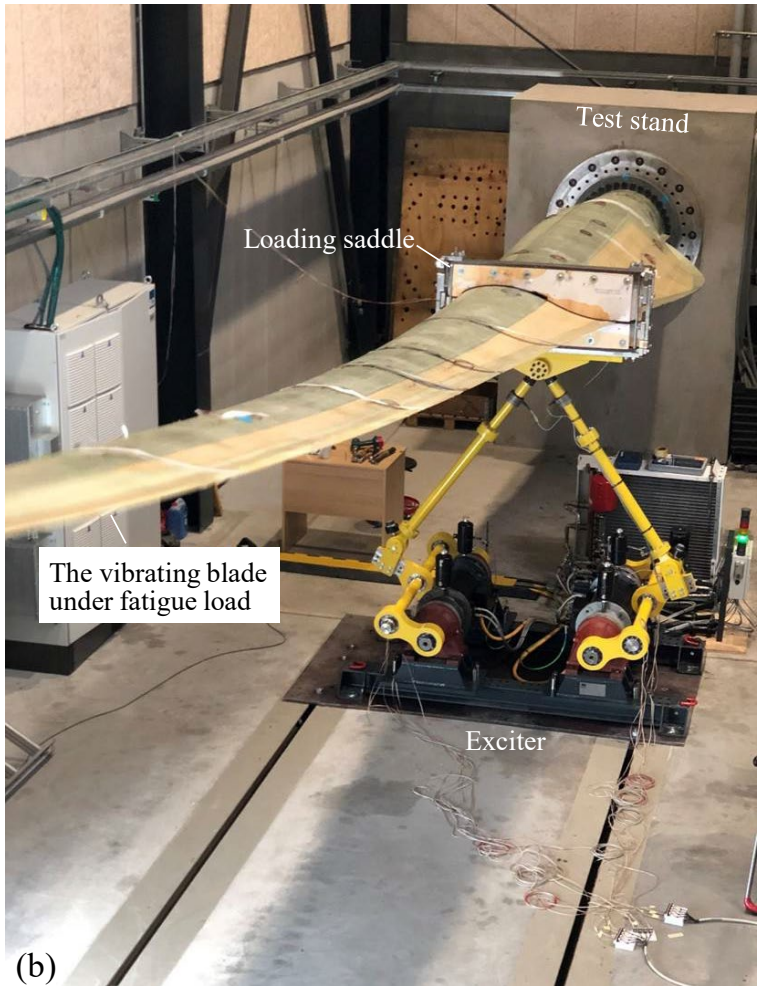
Most current methods:

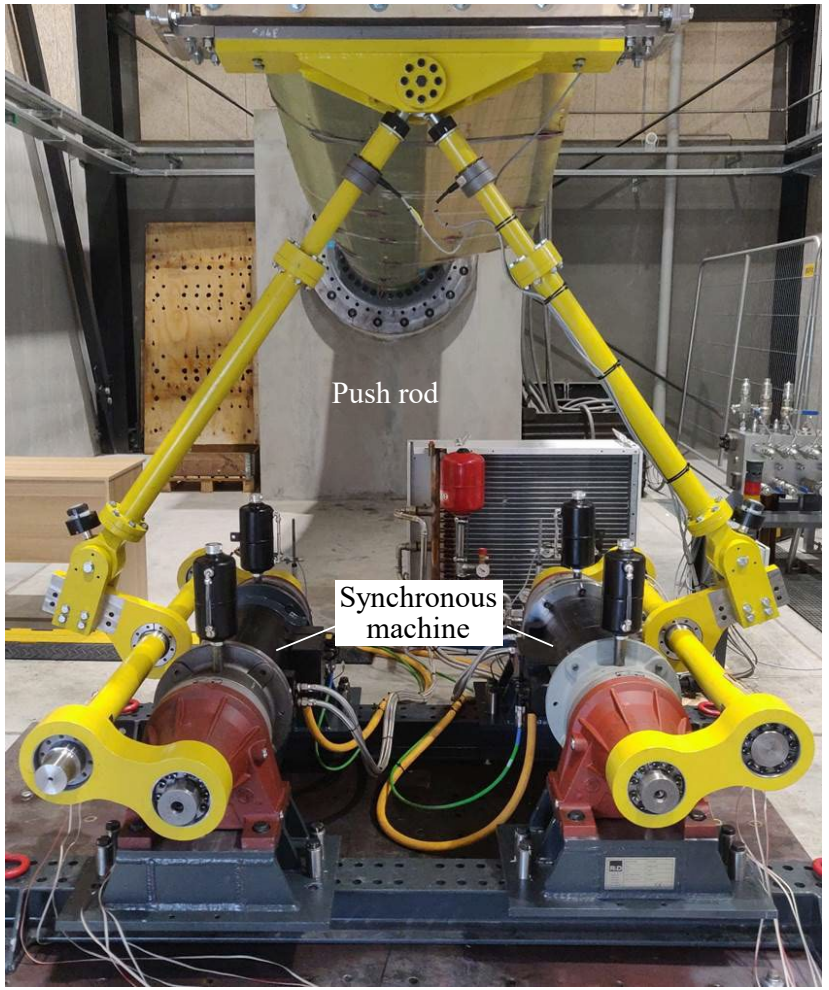
- Labor-intensive
- Surface damage
- Need turbine stop
- Evaluation is a separate step

Advanced blade inspection: AQUADA

Blade damage detection and evaluation at the same time

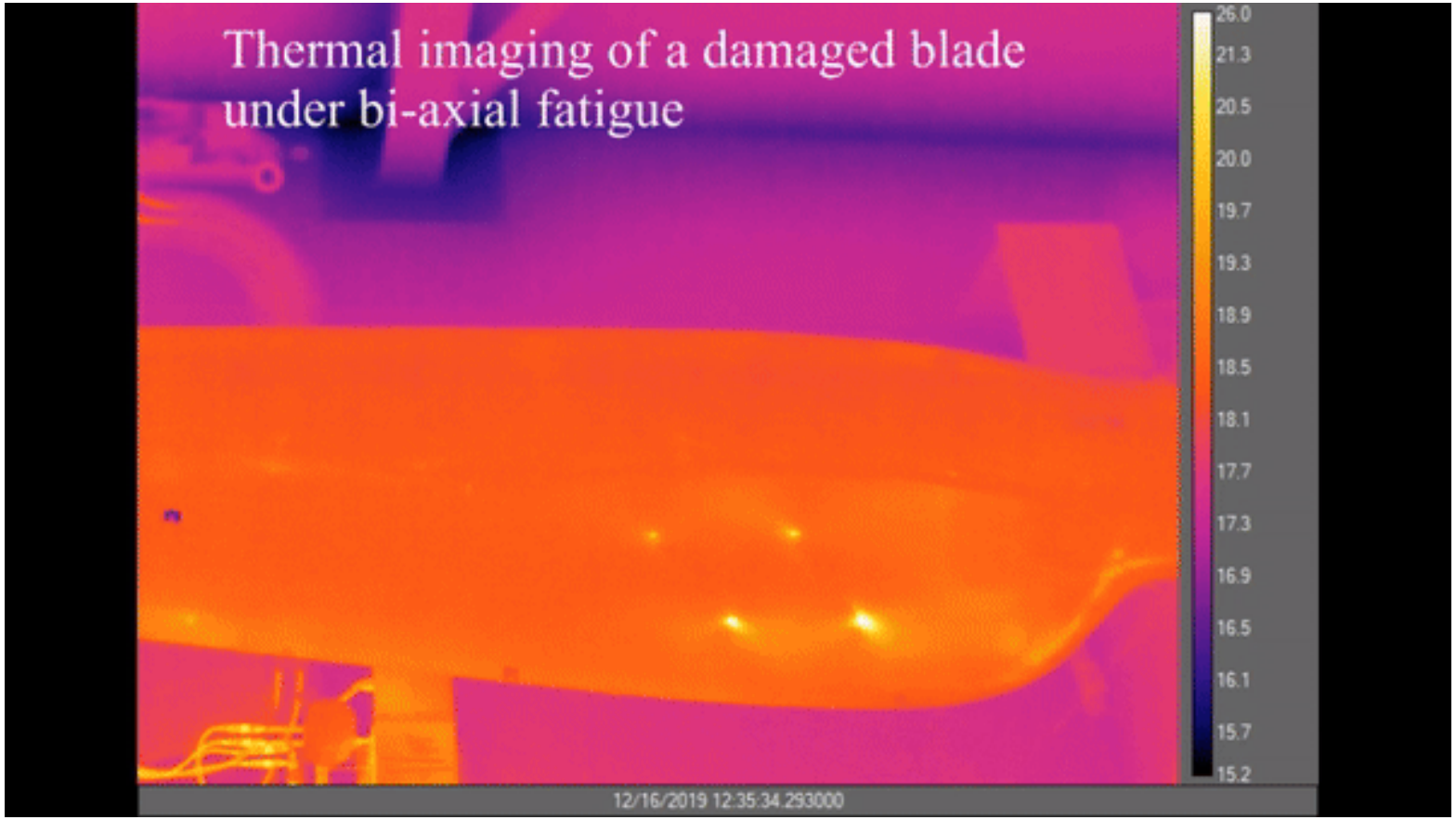




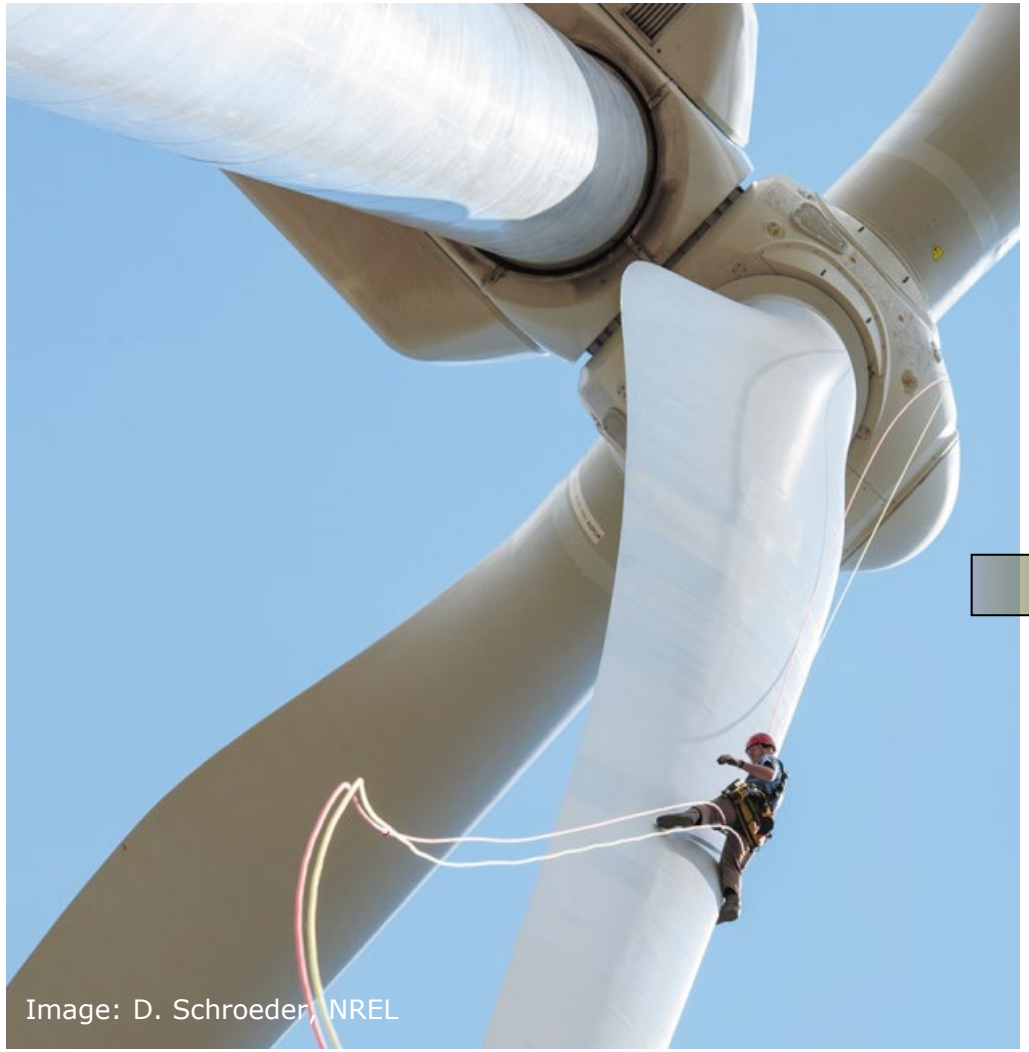


Advanced blade inspection: AQUADA

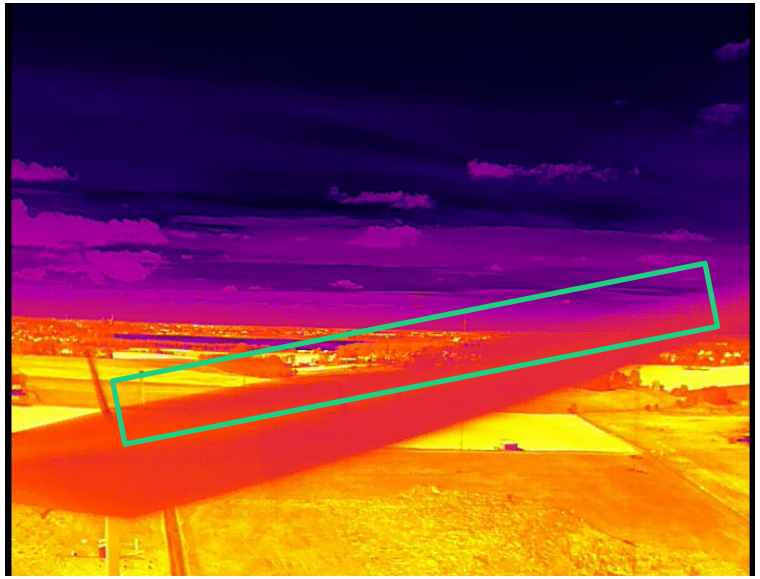
Blade damage detection and evaluation at the same time



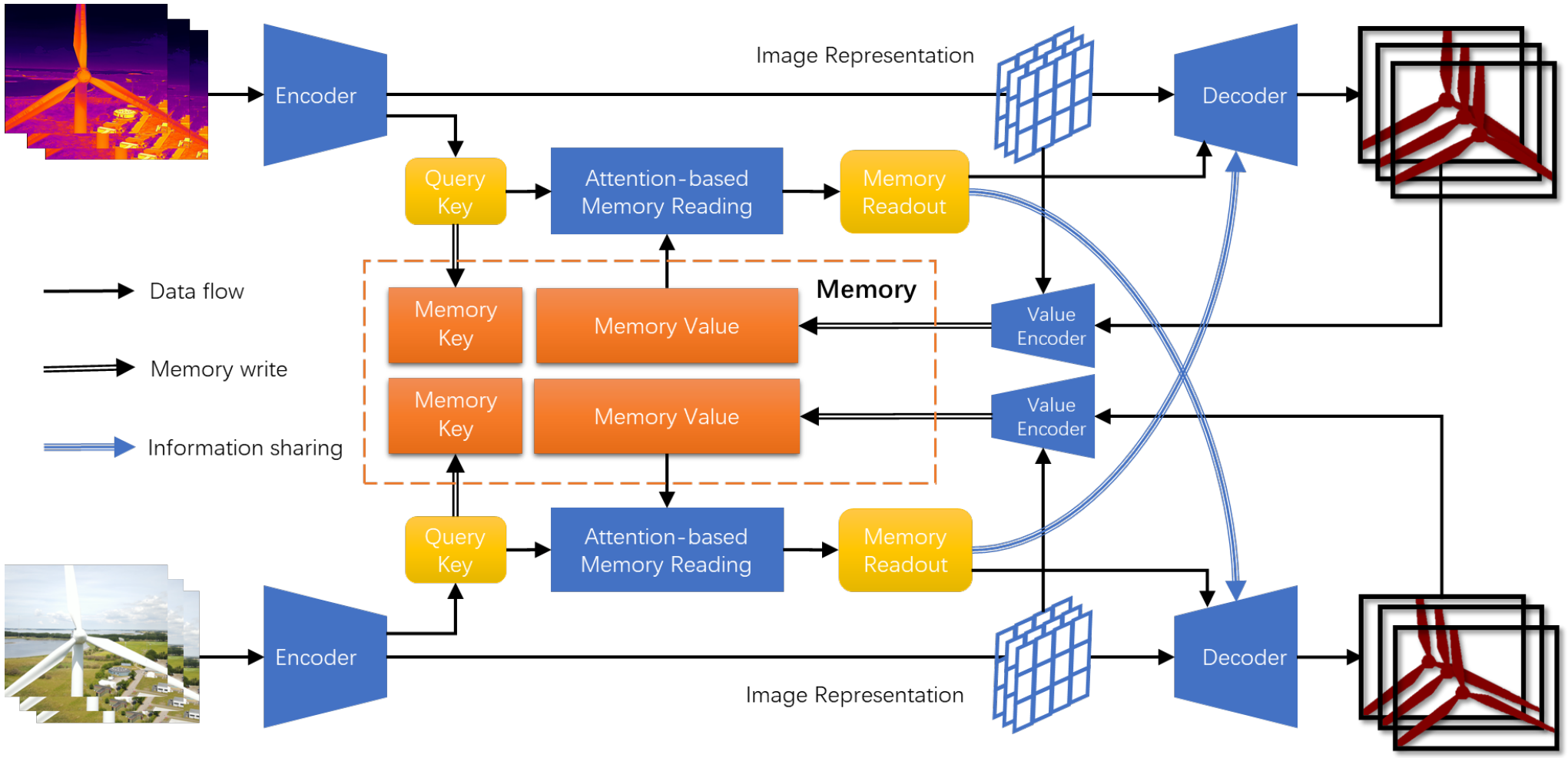
AQUADA-GO for field application



AQUADA-GO for field application

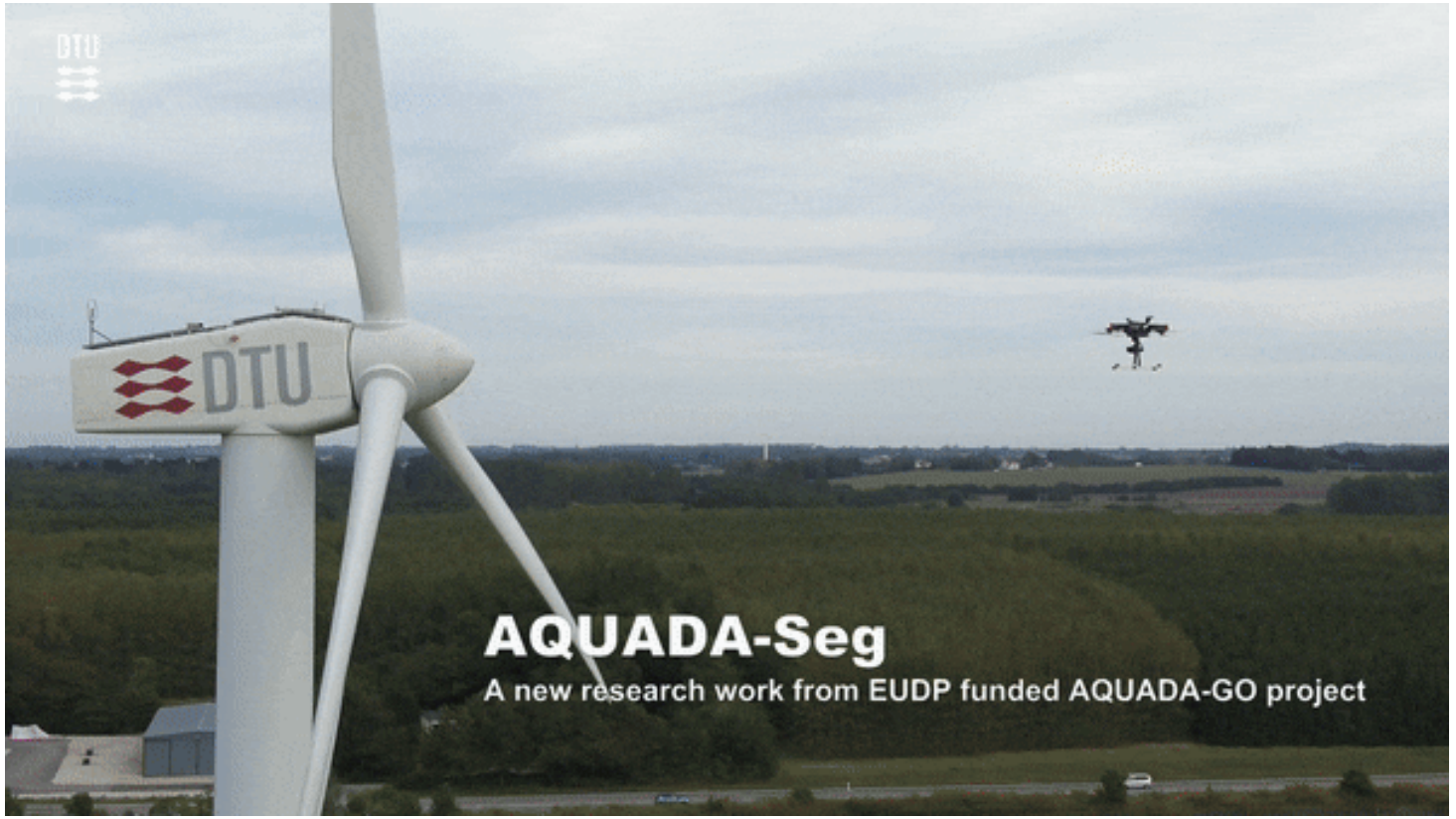


AQUADA-GO for field application – AI model



Data set: 111,760 images, **100** optical videos and **100** thermal videos, taken from **22** wind turbines

AQUADA-GO for field application

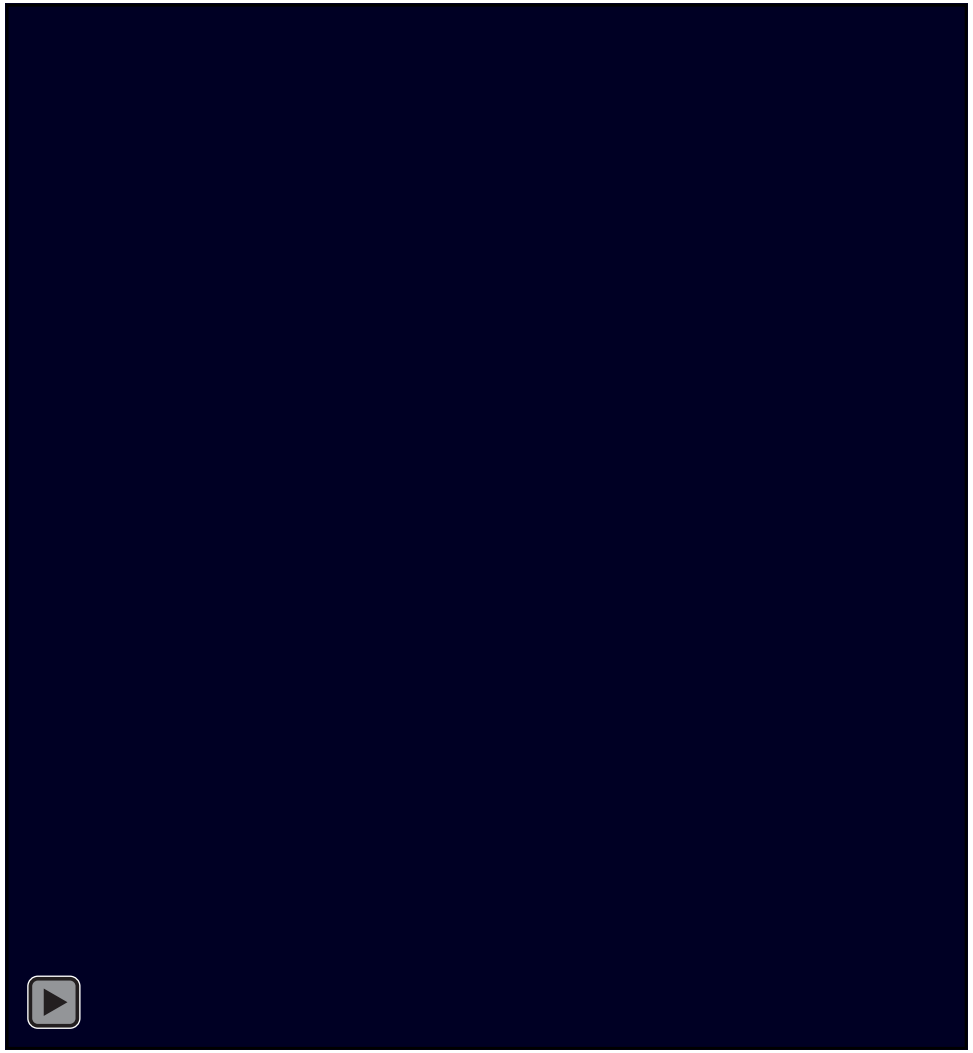


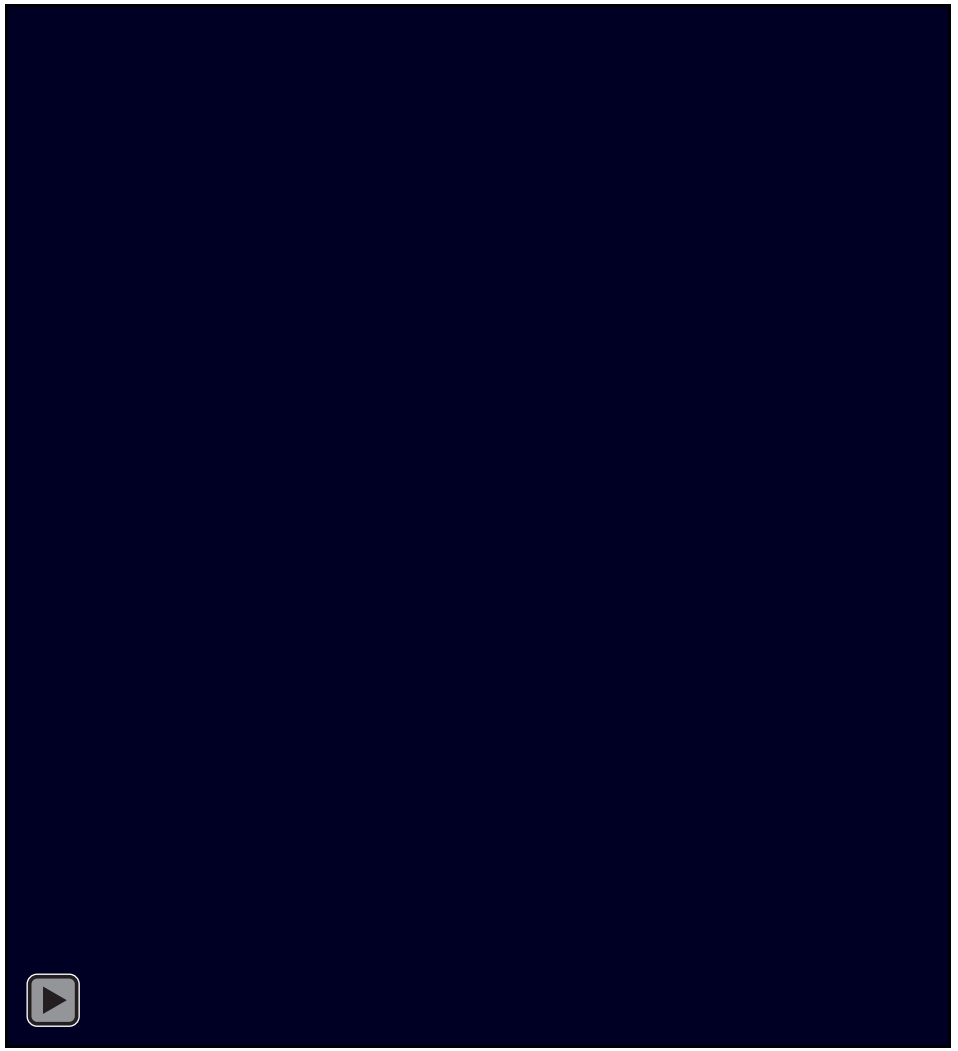
Danish EUDP project
AQUADA-GO in partnership
with *three wind farm operators*

DTU RWE TotalEnergies Statkraft energy CLUSTER DENMARK Quali Drone

Project budget: 25 million DKK
Duration: 2023.01 - 2025.12
Project no.: 64022-1025

AQUADA-GO for field application





Concluding remarks

- DTU's AQUADA method inspects blade damage *without stopping* blade *testing* in facilities and turbine *normal operation* in the field
- The method is based on *thermography*, *AI* and *computer vision*
- Damage *detection* and *evaluation* are done in one single step near real-time


Thank you!
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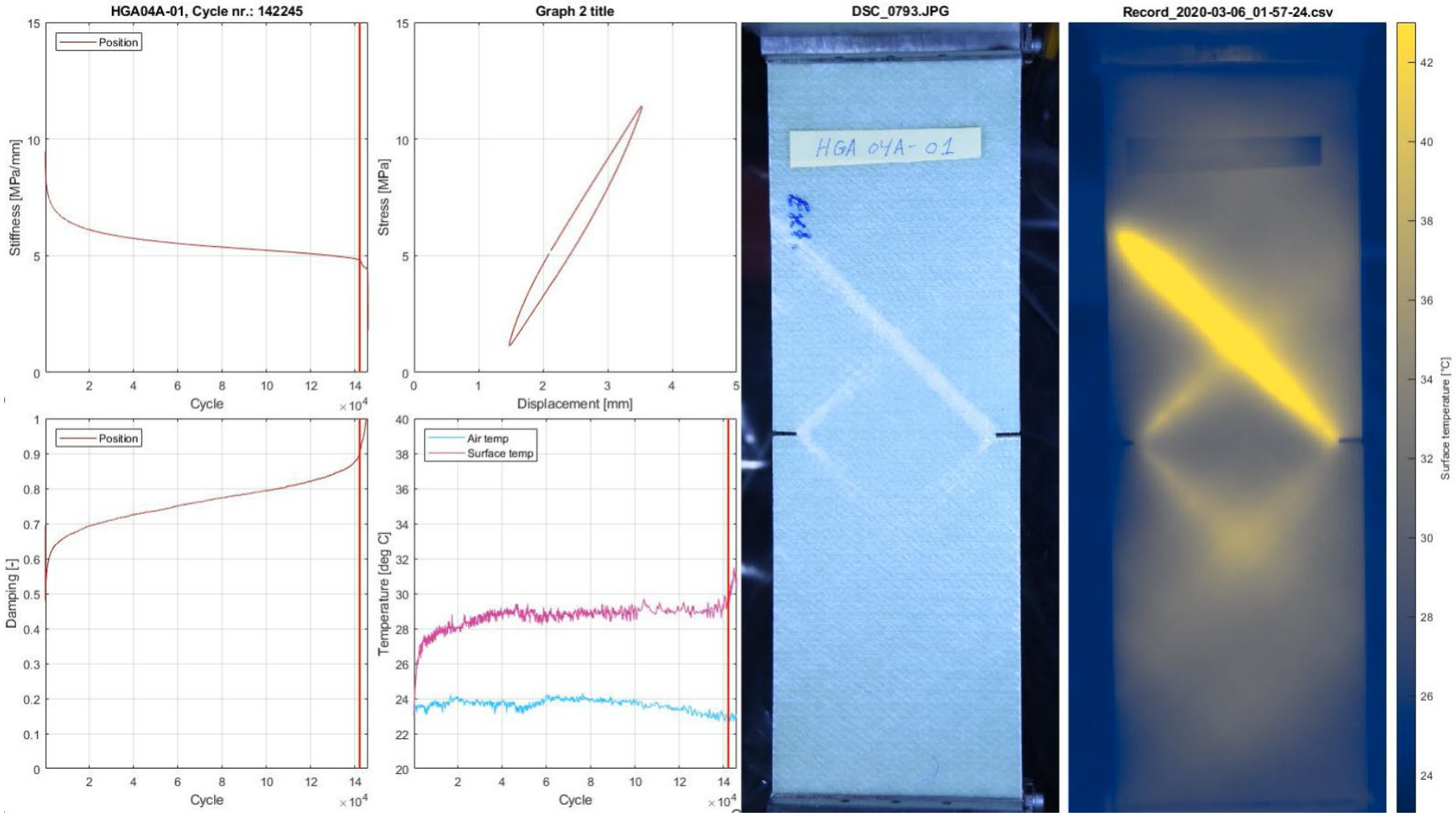
Experimental Validation



Experimental Validation