AIRTuB-ROMI WP1

Progress Update
December 2024 – November 2025

MISTRAS
Tarucca
DEHN
TU Delft
Eneco
Deutsche Windtechnik
TNO
VATTENFALL

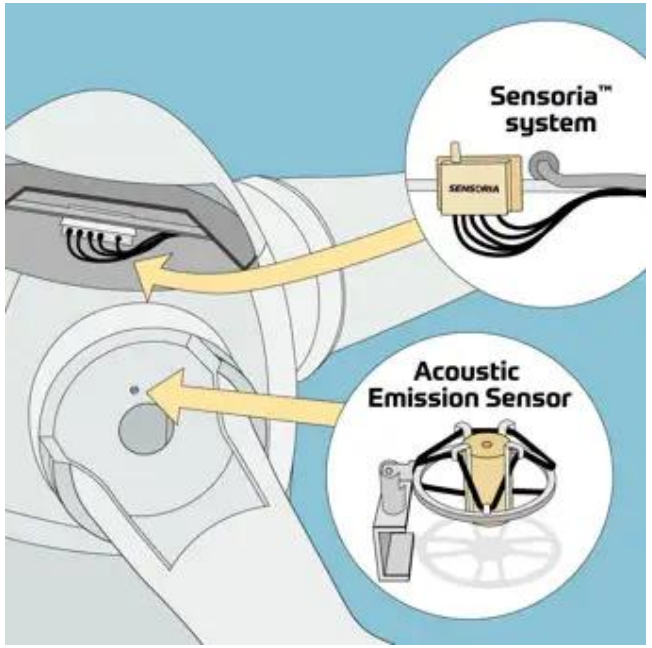
AIRTuB ROMI

WP1 Overview & Objectives

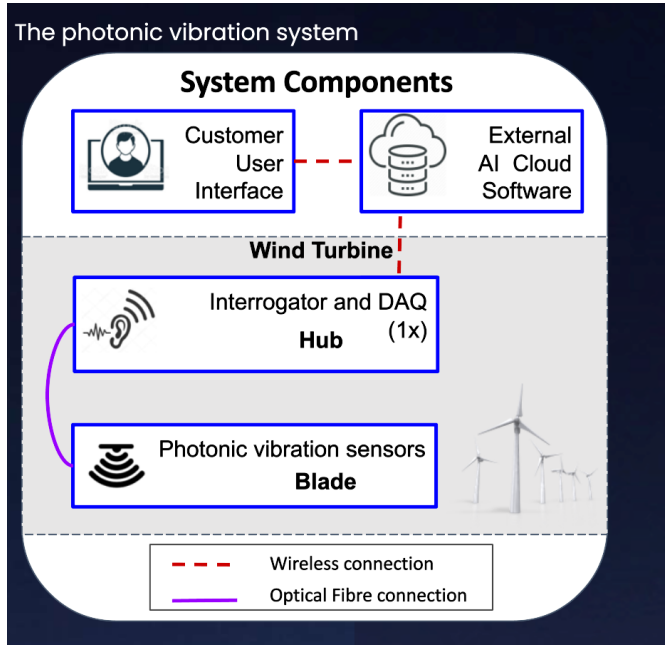
- Development & Application of blade **Structural Health Monitoring:**
  - Sensor-in-blade monitoring solutions
  - Direct inspection drone-crawler to damage area on blade for UT scan
- Sensor systems: **Mistras** (acoustic), **Tarucca** (vibration), **Dehn** (lightning)
- Turbines: 2 onshore + 2 offshore Vestas V80
- Goal: Installation, validation & data integration for WP2

St. Antoinedijk & Prinses Amalia

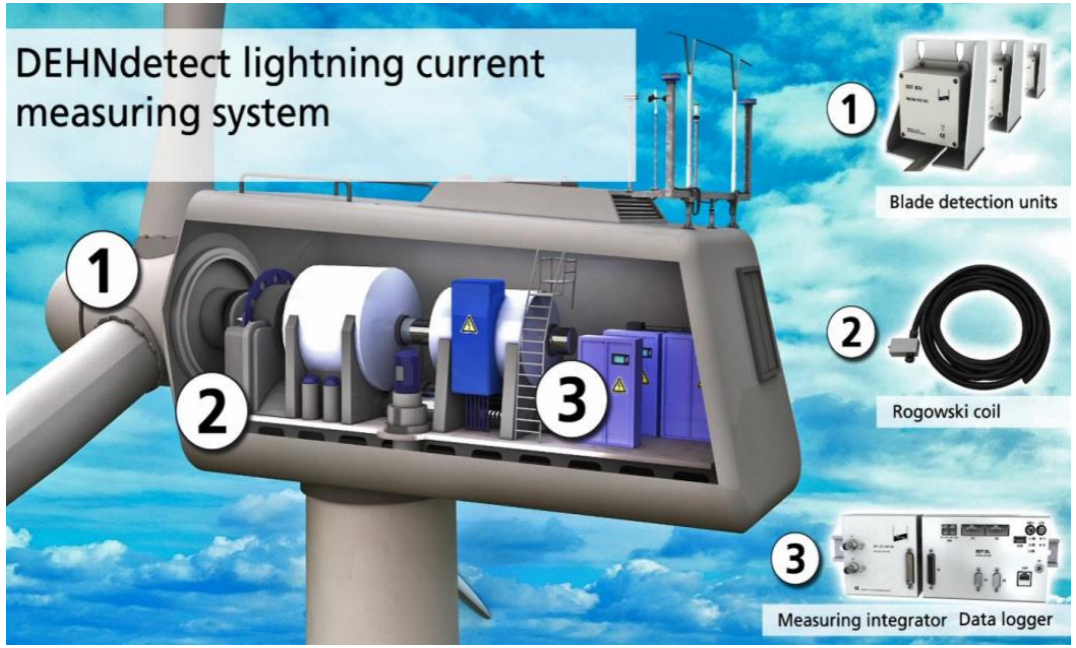
Mistras



Tarucca



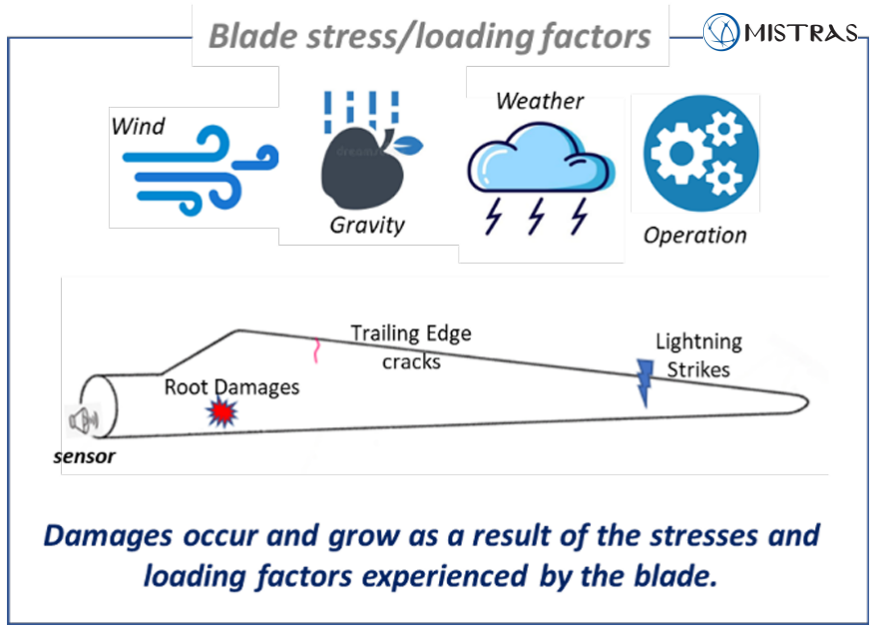
Dehn



Company	Sensor	Impact	Lightning	Damage	& Location
Mistras	Acoustic	Yes	Partially	Yes	Partially
Tarucca	Photonic vibr.	Yes		Yes	Partially
Dehn	Lightning		Yes		
DATA FUSION		Yes	Yes	Yes	Yes

Monitoring Activity: Vibrations, Sounds, Currents

events & trends



RPM increase causes proportionally

- Low frequency Acoustic Emission Activity
- Low frequency Acceleration Vibration Activity

Data analysis reveals changes in structural health ➔

Capture major damages prior to failure.

Tarucca

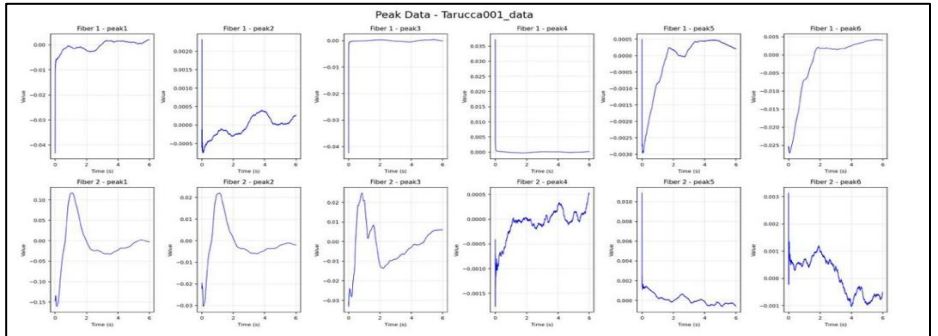


Figure 4: Peak data collected of 12 sensors during system verification test on 10 October.

MISTRAS

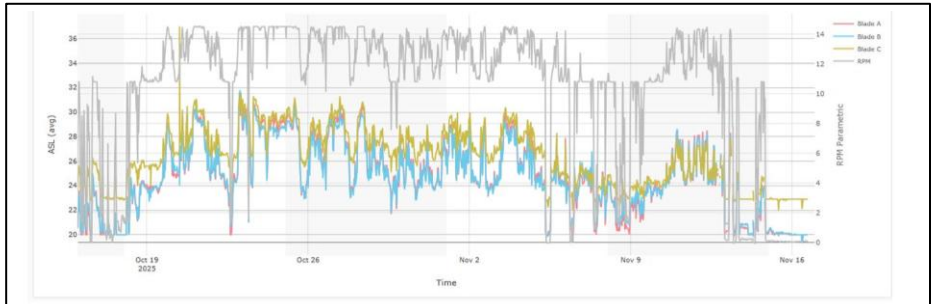
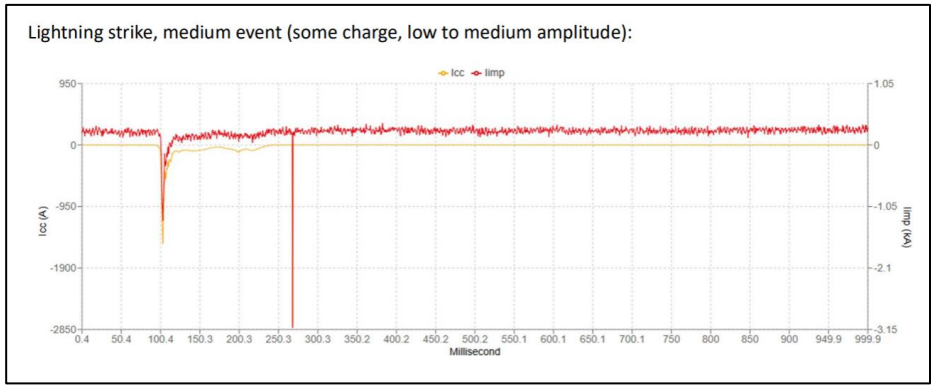


Figure 7: Average Signal Level (ASL) or background noise per blade/sensors during the first month of system operation. Blade C shows increased background noise compared to the other two blades.

DEHN



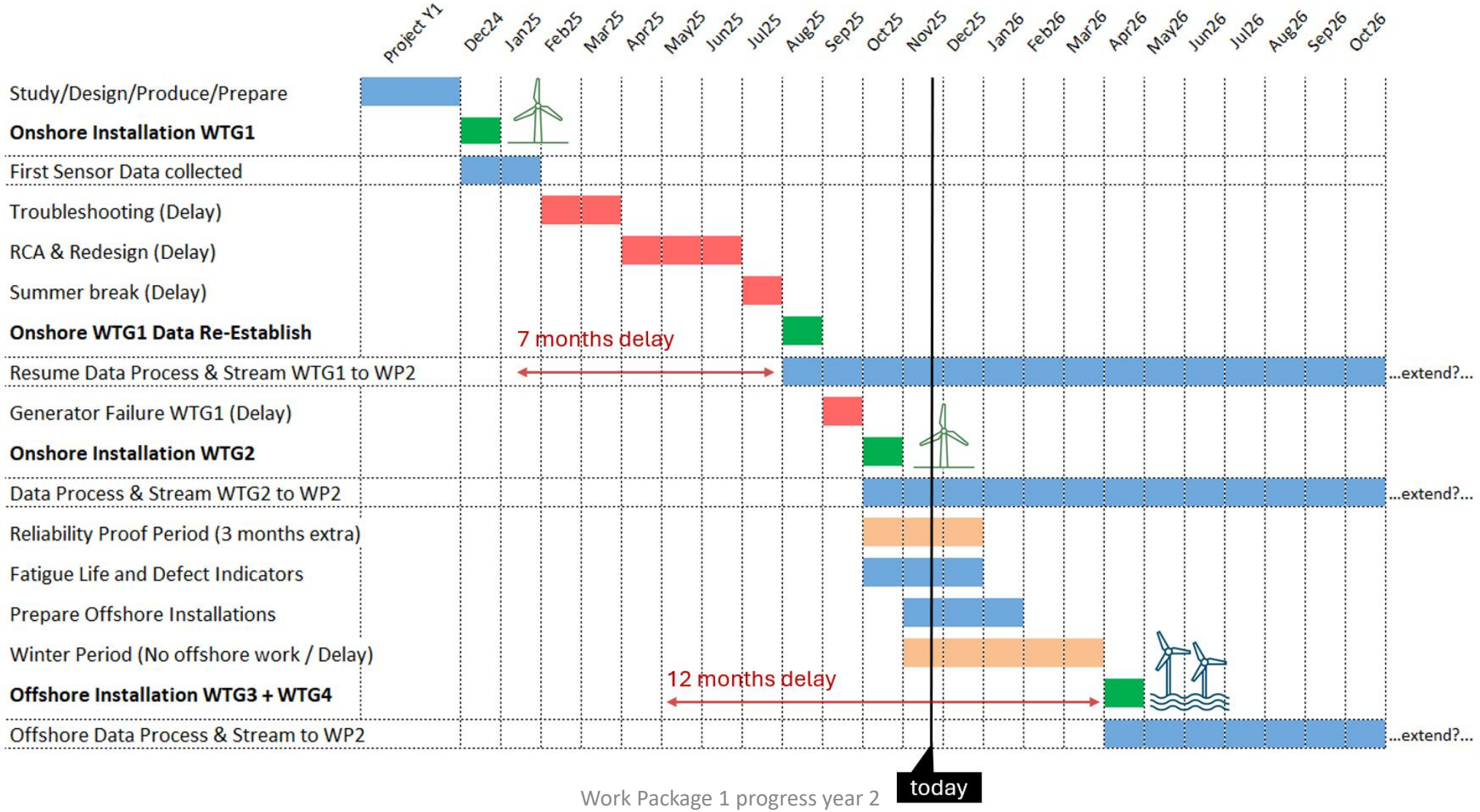
Key Challenges year 2

1. Installation alignment (WMS) with 5 involved parties
2. Cable tray failure causing 6-month downtime (Mistras & Tarucca)
3. Electrical instability: breaker tripping (Mistras & Tarucca)
4. Component lead times (SHM) & supplier availability (DWT)
5. Connectivity issues (Dehn system)
6. Generator failure (non-project) delaying installation on 2nd turbine
7. Overspending (time/budget) due to system failures and redesigns
8. Achievable level of damage localization; data fusion 3 sensor types
9. Winter period delay / no offshore activities

Mitigations & Solutions

- Adopted bungee-cord routing (validated onshore)
- Electrical redesign: D-curve breaker
- Revised & reduced scope (onshore + offshore): 1 + 5 ➔ 2 + 2
- Improved Dehn antenna on WTG 2
- Updated WMS & optimised installation sequencing
- Reinstated WP1–WP2 data-integration meetings

Planning – Back on track since Aug.

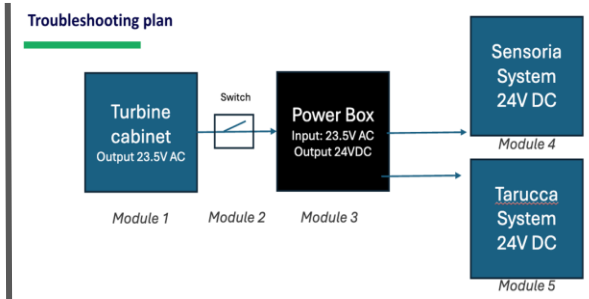


Progress – Overall 70%

Deliverables	%	progress	WP1: Development & application of blade health monitoring technology	Responsible	Support
d1.1	100%		Study & Design SHM system	Tarucca, Mistras, Dehn, TU Delft	
d1.2	100%		SHM System & WMS ready for installation	Tarucca, Mistras, Dehn	Eneco
	100%		Installation on operational onshore wind turbine(s)	Tarucca, Mistras, Dehn	Eneco
	10%		Installation on operational offshore wind turbine(s)	Tarucca, Mistras, Dehn	Eneco
d1.3	90%		Sensor Data Processing, Fatigue Life and Defect Indicators, Data Stream to WP2	Tarucca, Mistras, Dehn, TU Delft	TNO
d1.4	25%		Identification of Damage Inspection Area for drone / crawler (per sensor type)	Tarucca, Mistras, Dehn, TU Delft	TNO

Testing, Measuring, Improving

cable routing



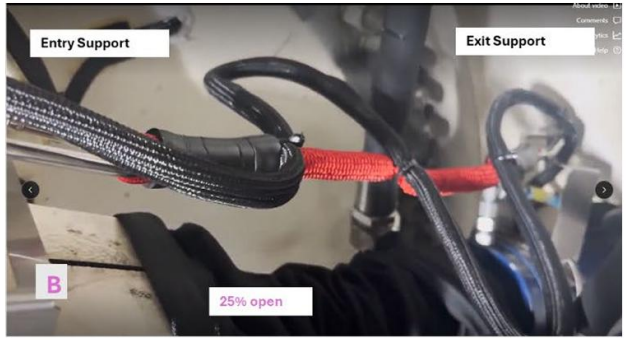
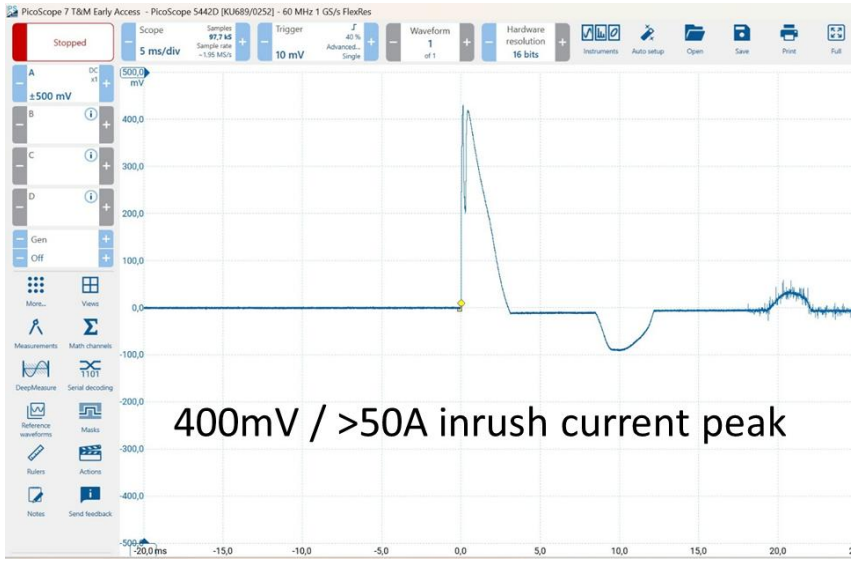


Figure 2: Pictures of the bungee cord setup at different extension levels, form fully closed (A) to fully open (D).

power system

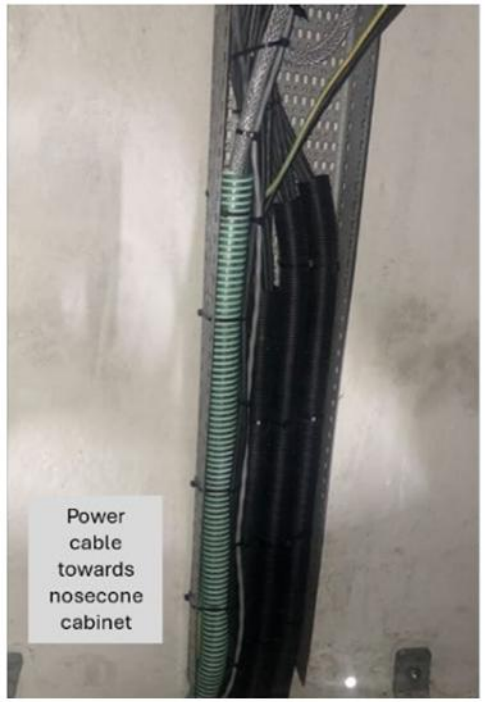


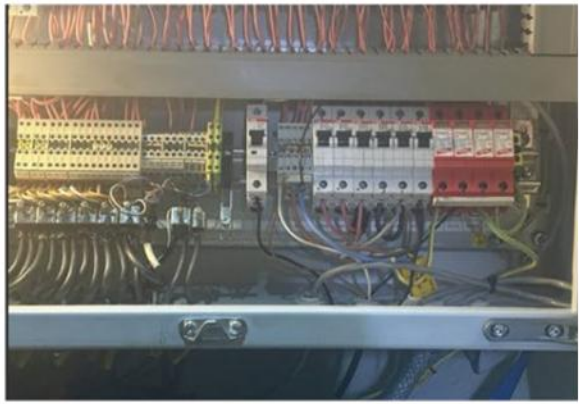
Heights

Confined Spaces

Night

Succesful installations & Sensor data on 2 turbines





Outlook to 2026

- WP1 entering validation & multi-turbine deployment phase
- Offshore installations planned for April 2026
- Focus on stable long-term operation
- i.c.w. WP2: Data fusion & harmonization, Fatigue Life and Damage Indicators, Damage Localization
- January 15: Sensor Knowledge Dissemination Event (@TU Delft)