

[https://youtu.be/mXQWhop\\_G1k](https://youtu.be/mXQWhop_G1k)

# ***PIONEERING UNMANNED MAINTENANCE IN OFFSHORE RENEWABLE ENERGY***



# **Welcome**



*Up to: 'Unmanned Maintenance'*



# World Class Maintenance



Fieldlabs & projecten



Kennis & achtergrond



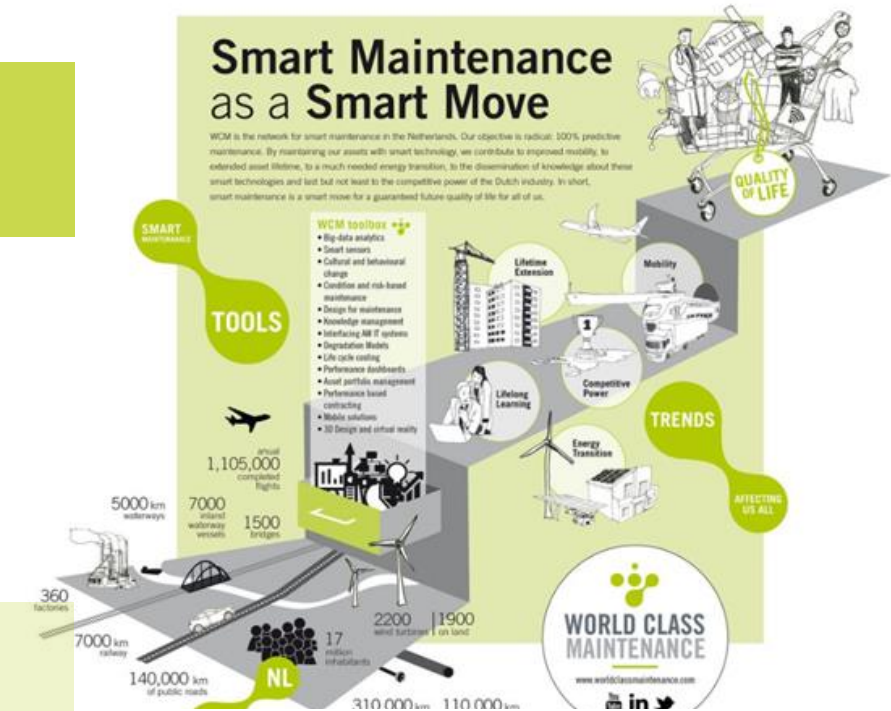
Lobby & politiek



Netwerk & leden voordeel

## The Dutch Network for Smart Maintenance

- Development and execution of cross sectoral innovation projects
- Participation of Asset Owners, - Managers, Service Providers & Knowledge- and Education institutions, Government
- Development of Fieldlab programs for complete industry sectors





WORLD CLASS  
MAINTENANCE

***INNOVATION***



WORLD CLASS  
MAINTENANCE

***TOWARDS***



WORLD CLASS  
MAINTENANCE

*UNMANNED*





WORLD CLASS  
MAINTENANCE

# *MAINTENANCE*



**WORLD CLASS**  
**MAINTENANCE**

***IN***





WORLD CLASS  
MAINTENANCE

*OFFSHORE*



WORLD CLASS  
MAINTENANCE

***RENEWABLE***



WORLD CLASS  
MAINTENANCE

***ENERGY***



# Fieldlab

## ZEPHYROS

# Why Unmanned Maintenance Offshore?

- The asset determines when an inspection or maintenance intervention is needed and not the...
- Unnessecary stand-still of turbines lifting LCOE
- Reduced lifetime of assets due to sub-optimal maintenance
- Growth to massive untenable offshore logistics with human based maintenance
- Lack of skilled human resources now and in the future (three D work)
- 

***AND TECHNOLOGY IS THERE!!***



# Automated Inspection and Repair of Turbine Blades



**STORK**  
A Fluor Company

**avans**  
hogeschool

**Eneco**

**TNO** innovation  
for life

**DEHN**

**Tarucca**

**DEMCON**  
advanced mechatronics

**TU Delft**

**INERTIA**  
TECHNOLOGY

**VATTENFALL**

**LM WIND POWER**  
a GE Renewable Energy business

**nlr**

**FUSION**  
ENGINEERING

**inholland**  
hogeschool

**Nest-Fly**  
Technologies

**Hz UNIVERSITY**  
OF APPLIED SCIENCES

**SAXION**  
UNIVERSITY OF  
APPLIED SCIENCES

**Scalda**

**Development Center for  
Maintenance of Composites**

**Hanzehogeschool  
Groningen**  
University of Applied Sciences

**Avular™**

**qlayers**  
Sensuring the leading reality

**NOBLEO**  
TECHNOLOGY

**Dutch  
Gerahertz**  
SPACE QUALITY INSPECTION

**AIRTuB**  
ROMI

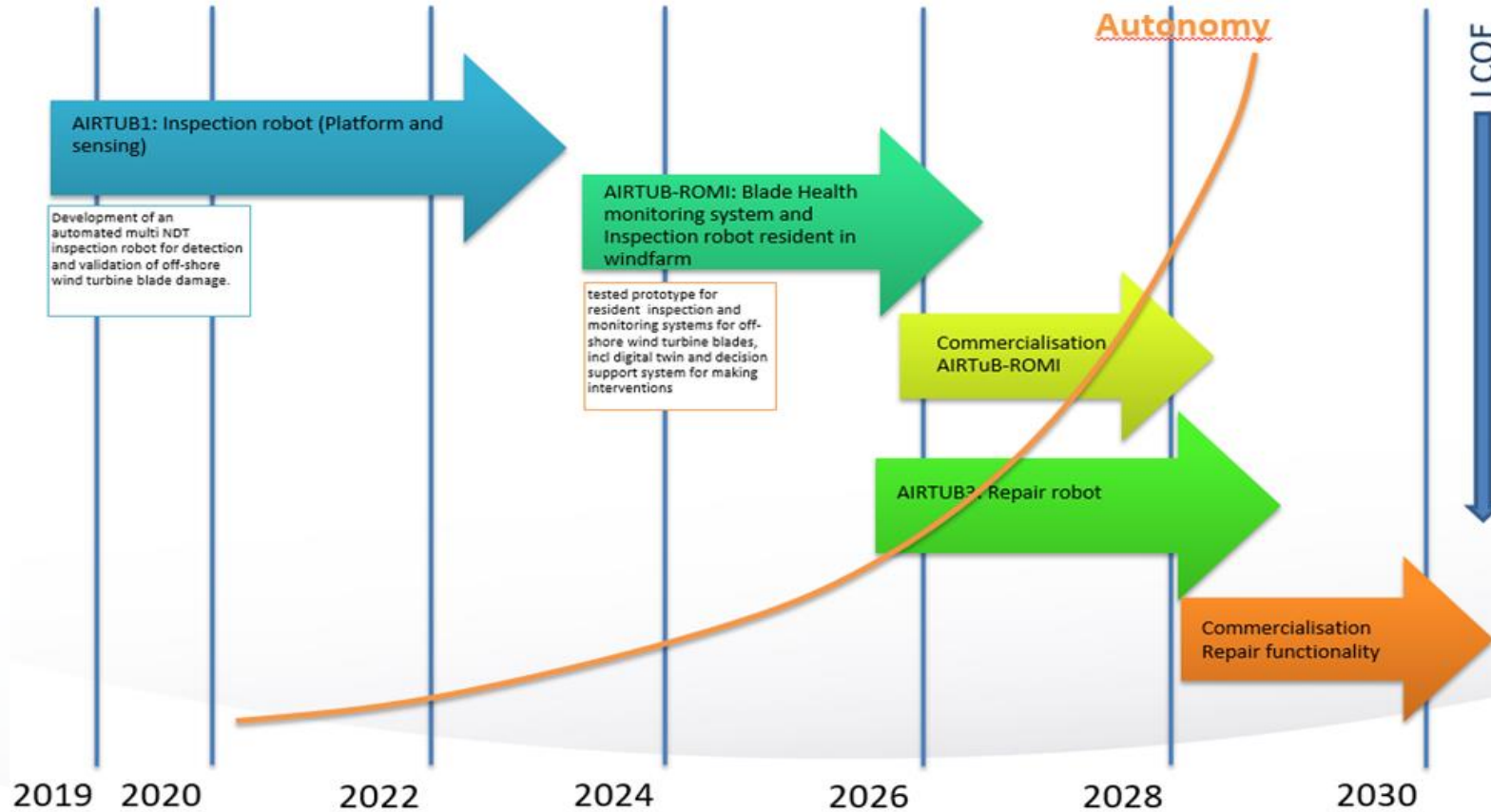






# AIRTuB *roadmap*

AUTOMATED INSPECTION AND REPAIR OF TURBINE BLADES



## Call for Action / Business Driver = Need for LCOE reduction

- Lifetime extension
- AEP improvement
- Maintenance logistics reduction
- Elimination of human presence offshore

## AIRTuB solution:

Fully autonomous robotized turbine blade maintenance by:

- Robotized inspection and repair system resident in windfarm
- Condition monitoring
- Frequent small high quality repair interventions

## Business model:

- Owner Operator (OO) contracts AIRTuB as a Service from Service Provider (SP)
- SP operates on performance contract with OO
- OEM of AIRTuB Equipment rents Robots to SP

- 13.30 Opening, welcome, introduction and program
- Vision on digitizing and robotizing in ORE – Floris Bonk – TKI-Offshore Energy
  - Transforming Offshore Maintenance with Aerial Robotics - Ayham Alharbat – Saxion UAS
  - Application of Robotics in Wind – Where we want to Go - Janaki Mohanan Nair – TNO Energy Transition
  - Samenwerken aan digitaal weerbare windmolenparken - Michel Mulders – FLECS
- 14.45 Pause
- 15.00
- Boost safety and speed in bolting operations! - Martin Kristelijn – Into Machines
  - The benefits of eye-tracking with smart glasses - Anikó van Nie – Viewpointssystem
  - Asset Management of an Offshore Solar Farm - Xander Wiefkers - Oceans of Energy
  - Update on the AIRTuB-ROMI project - Jeroen Verschelling – World Class Maintenance
- 16.00 Marketplace with demonstrations of Nest-Fly, Into Machines, Inholland UAS, Saxion UAS, NLR and Terra Inspectioneering
- 16.30 Drinks and bytes

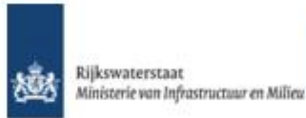


Innovate together – JOIN US!



[www.worldclassmaintenance.com](http://www.worldclassmaintenance.com)

Fieldlab Zephyros Steering Committee



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# Viable Offshore Renewable Energy requires Smart Maintenance



*Detect & investigate OW maintenance challenges*

*Stimulate & facilitate collaboration (triple helix)*

*Initiate & facilitate (funded) innovation projects*

*Facilitate testing and demo's in living labs*

*Provide expert judgement*

*Support knowledge development by sharing*

