Robotics in Wind

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TNO Wind Energy

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Code: **8144 6122**

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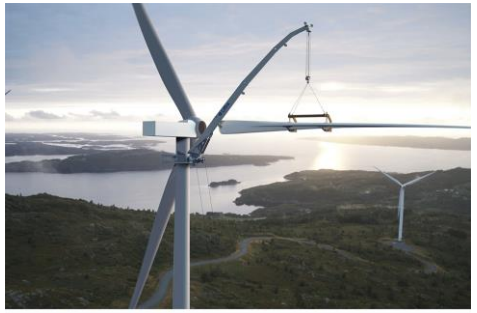
Robotic Applications in Wind

Automated Inspection, Maintenance & Repair (IMR)

Innovative robotics applications for inspection & maintenance of wind farm assets

Installation & Decommissioning (I&D)

Integrating robotic solutions to installation & decommissioning activities of wind farm



Data Security

ROBOTIC APPLICATIONS IN WIND

Connectivity

Data-driven Optimization

Ecology & Environmental monitoring (EEM)

Advanced robotic monitoring, data collection & impact assessment of wind farms & hybrid energy systems on ecology & environment

Hybrid System Applications (HSM)

Integrating robotic solutions for hybrid system operations including IMR, Installation & decommissioning

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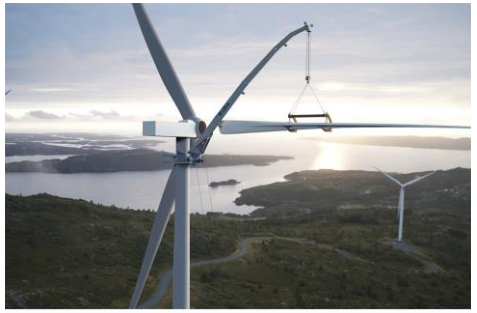

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Automated IMR

External inspection and repair

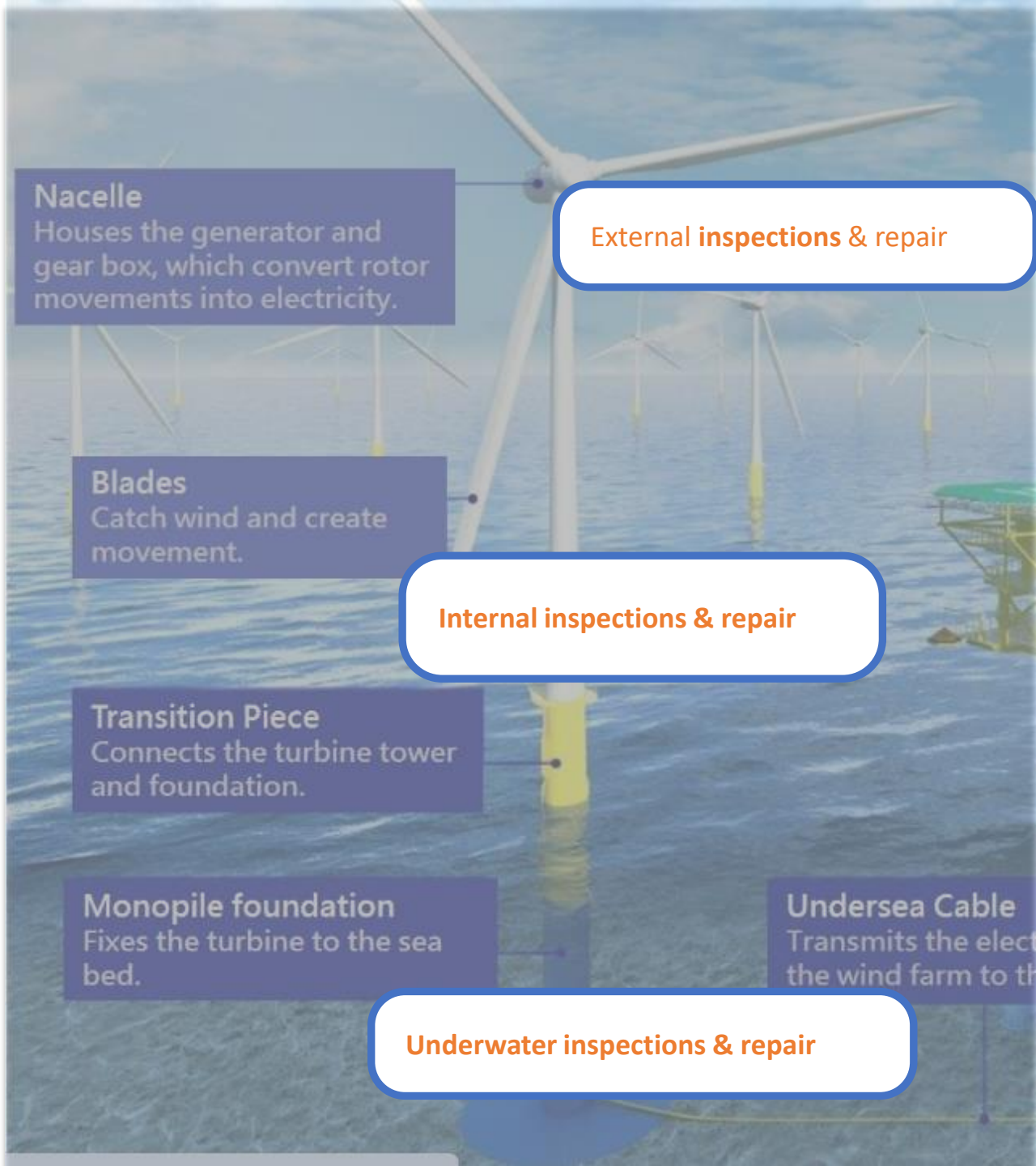
- Inspection drones
- Cleaning robots
- …

Internal inspection and repair

- Caged drones
- Bolting robots
- …..

Underwater inspection and repair

- Unmanned service vessels
- Underwater drones
- ….



PRIMA USV

- Study the impact of performing remote inspections of offshore wind assets using uncrewed surface vessel (USVs).
- Focusses on underwater inspections using ROV and MBES inspections
- Demonstration of underwater inspections using Fugro USV was conducted earlier together with Vattenfall at Aberdeen
- Very high savings on the carbon emissions and safety aspects.

TNO

FUGRO

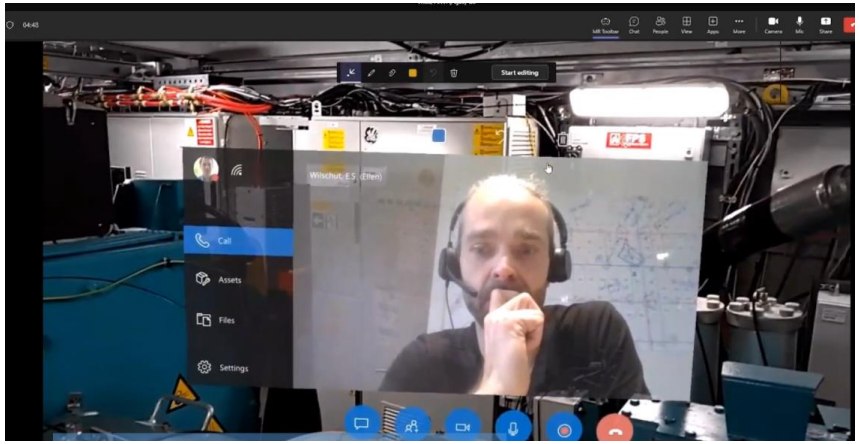
VATTENFALL

PRIMA Cargo Drone

- Evaluate the potential of cargo drones for transporting tools and spare parts required for wind turbines
- Impact on:
  - Cost
  - Downtime of assets
  - Emissions
- Field trials in offshore wind farm to study the workability parameters of cargo drones and usecase validation – cargo drone transporting tools up to 30kg from a SOV.

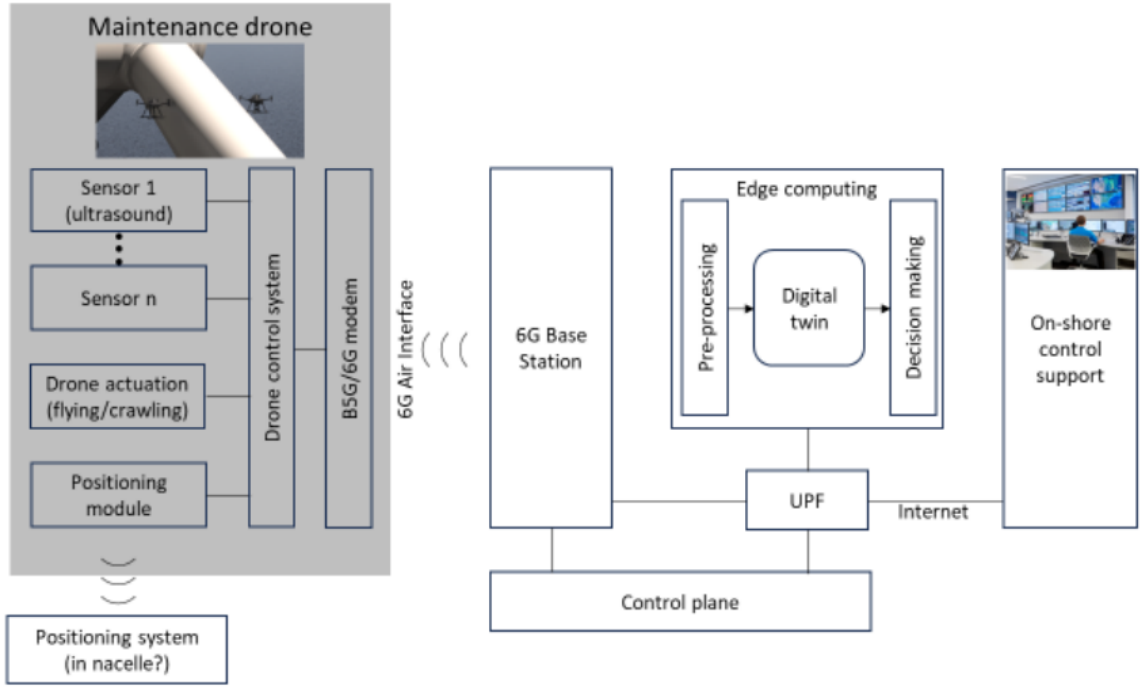
Brains4Work – Smart Glasses

- Smart View on Wind - Remote assistance for wind turbine technicians with use of AR glasses.
- Useful for less experienced technicians for trouble shooting – stratgic use of our skilled workforce
- Challenges – difficult to work with the glasses in confined space, technology adoption



Amazing 6G

- Analyzing the use case of beyond 5G connection for robotized wind farm operations
- Localization of drone on the wind turbine blade
- Real time decision making
- Testing in controlled environment – FieldLab Zephyros



Bladeguard

- A robot that can install sensors deep inside the blade
- Prototype being developed by TU Delft students as part of their Minor Project
- Testing in controlled environment – FieldLab Zephyros

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Theme name

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Thank you for your attention

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