WindFusion Mesh

Agentic AI & Sensor Fusion for Smarter Wind Farms

Vibration

SCADA

Lidar

Acoustic

Agentic AI Layer

- Sensor Fusion at the Edge
- Agentic AI Layer
- Resilient Ad-hoc Networking
- Digital Twin Integration
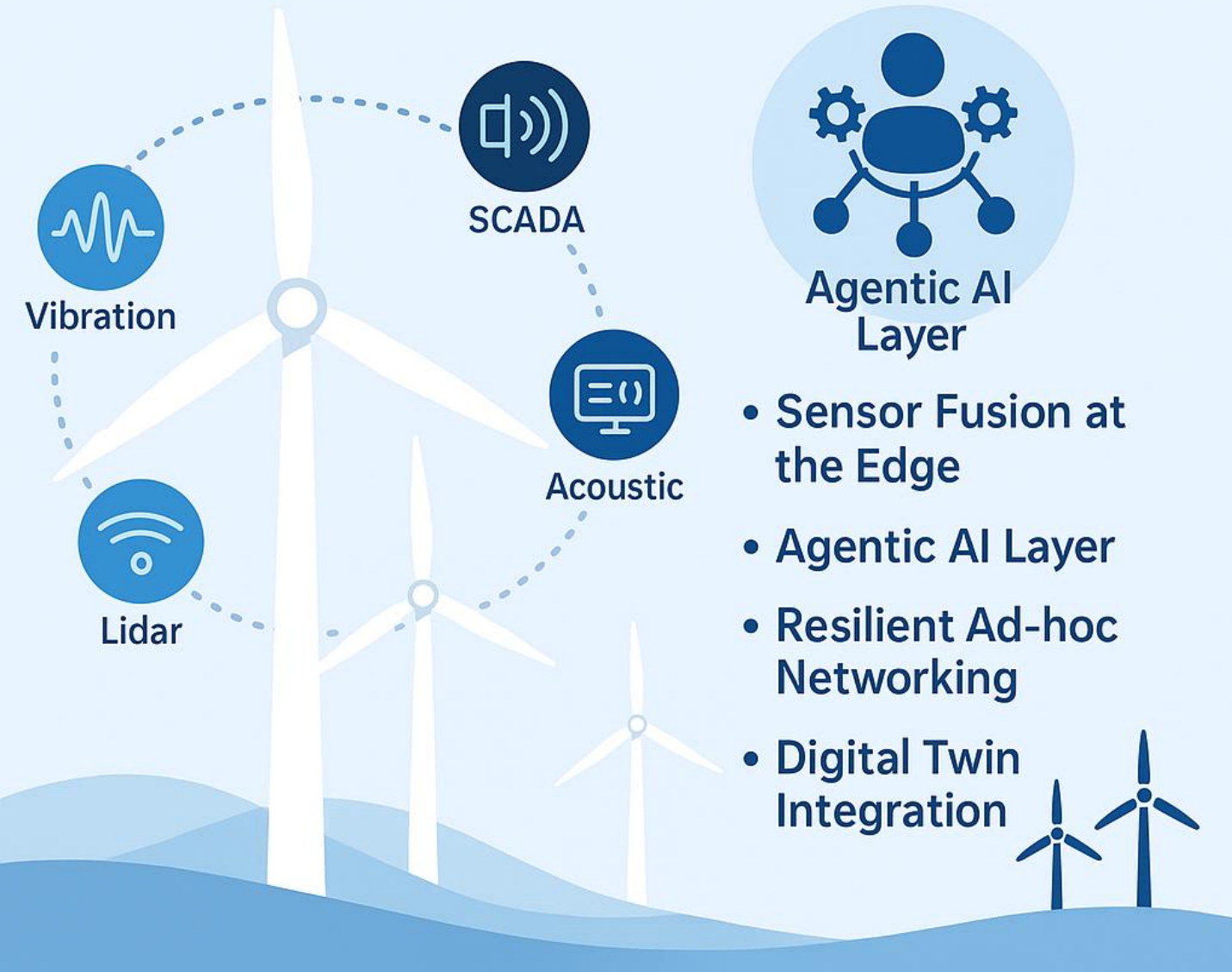
arinna nova

WindFusionMesh
by
ArinnaNova

Problem

- Wind farms are becoming larger and more complex, both onshore and offshore. Current predictive maintenance (PdM) and monitoring rely heavily on siloed SCADA/CMS data and cloud analytics.

Gaps identified:
- Limited data **interoperability** between turbines, operators, and supply chains.

- Low performance due to wake.

- PdM solutions are often cloud-only, with **weak edge resilience**.

- Health states and wake effects are **rarely fused** into holistic farm control.

- Integration into EU data spaces (ENERSHARE, PLATOON) is incomplete.
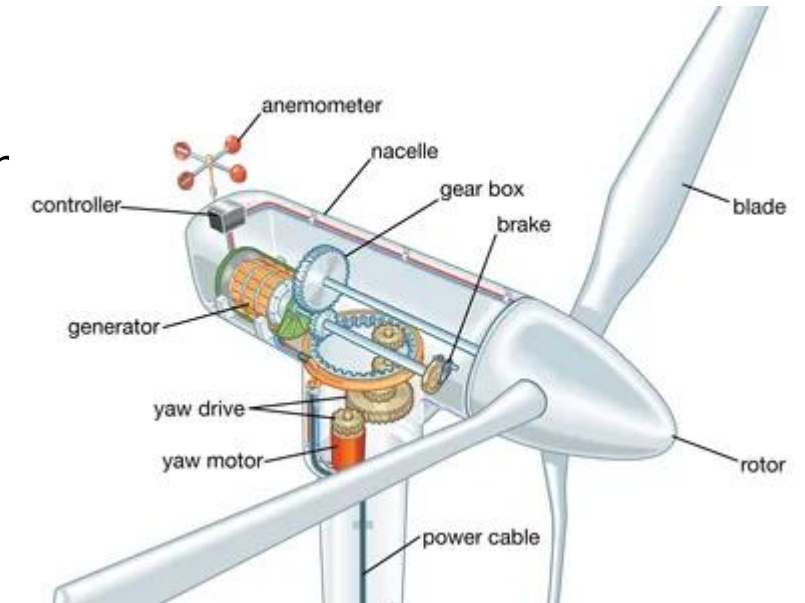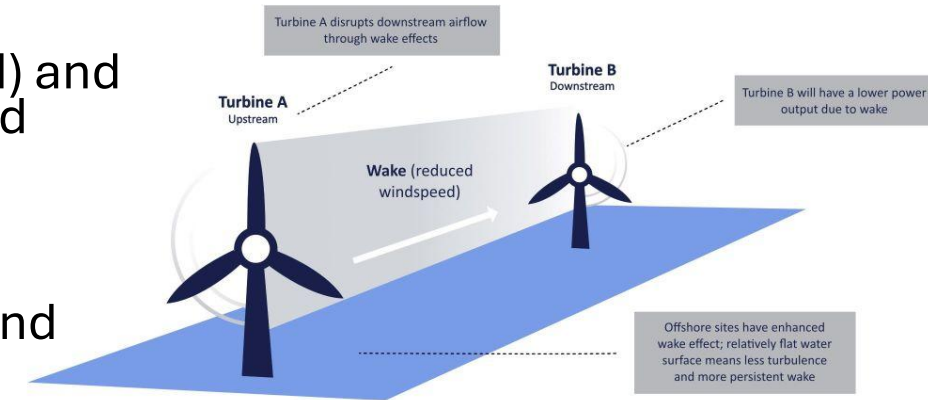
Solution: WindFusionMesh

- Develop and validate an edge-first sensor fusion platform for turbines (vibration, SCADA, lidar, acoustic, metocean).

- Deploy a resilient ad-hoc networking mesh between turbines with GNSS/PTP time sync.

- Create interoperable connectors to EU energy data spaces, sharing features not raw data.

- Extend digital twins with wake + health-aware control for improved AEP and reduced O&M.

- Multi-agent system that continuously monitors data stream

- Pilot the system in onshore and offshore wind farms in EU.

Problem
- Wind O&M costs remain high due to siloed SCADA/CMS uata
- Offshore farms face unreliable connectivity & harsh RF environments
- Digital twins exist but lack integration of nealth + wake states
- Limited interoperabilitly with EU energy data spaces

Our Solution

Lidar
icustic
Vibration

Sensor Fusion at the Edge

Resilient Ad-hoc Networking with GNSS PTP Sync & Failbacks
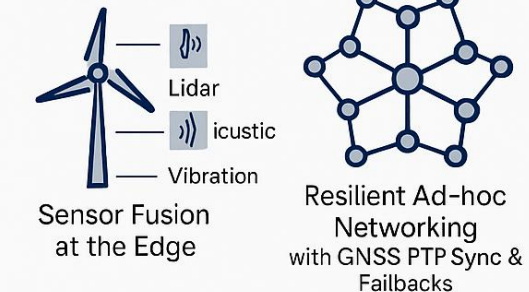
Expected Impact
- **30-50%** faster fault detection
- **20%** fewer false alarms
- **10-15%** lower O&M costs
- **1-2%** more AEP
- **≥20%** faster Mean Time to Resolution (via agents)
- Bandwidth reduced by ≥10% with edge-first decisions

Anomall   Networking
Agentic Al Layer
Twin Orehestrator   Planner

Agentic Al Laye
Agentic Al Layer
Anientic aware control
Wake-aware control eɑpilanability, model
▸ sighing, hurnan-in-the-loop safety

Use Cases
- Blade erosion detection with proactive spares ordering
- Gearbox anomaly → temporary derating–+ scheduled repair
- Wake-aware yaw optimization balancing AEP and health
- Link outage → self-healing mesh rerouting

Consortıum Needs
ArinnaNova B.V. (NL)

Consortium

- Coordinator: **ArinnaNova**, expertise: sensor fusion, resilient networking.

- End-Users / Demonstrators: **Wind Farm Operators**

- Technology Providers (SMEs / Industry): Deliver and adapt hardware/software components for networking and **wake optimization**

- Research & Technology Organisations (RTOs / Universities): wind farm **digital twins**, wake modelling, **edge AI algorithms**