

Use Case

Wind Turbine Control with Edge AI



**Boost energy output, cut maintenance costs,
and maximize ROI.**

/ Challenge

Rising Energy Demand and the Need for Higher Turbine Efficiency

Global demand for renewable energy is accelerating, placing increasing pressure on wind farm operators to maximize generation while minimizing downtime.

Inefficient turbine operation, caused by fluctuating wind conditions, mechanical stress, or misalignment, can significantly reduce output and drive up maintenance costs.

Achieving consistent, optimized performance across all turbines is critical to meeting energy targets and protecting ROI.

/ Project Objectives

Maximizing Energy Output and Operational Efficiency

- Optimized energy production at the turbine and wind farm levels
- Continuous AI model refinement to improve efficiency
- Enable predictive maintenance to prevent failures and extend component life
- Ensure stable performance in highly variable wind conditions

/ Summary

WHO: System Supplier

WHAT: Manages onshore & offshore wind farms with precise turbine control

HOW: Edge AI systems process sensor data locally, sending only key insights for centralized, real-time optimization.

VALUE: Higher energy yield, lower maintenance costs, longer turbine life, stronger ROI, and sustainability impact



Book a Free Demo

<https://www.aicas.com/book-demo>

/ Solution

Edge AI and Smart Data Management for Realtime Turbine Optimization

An operator deployed Edge AI and aicas Edge Data Management to the local turbine control system. The system continuously monitors turbine sensors, including anemometers, wind vanes, pitch motors, yaw drives, and converters. It captures realtime data such as wind speed, direction, pitch, yaw, and generator output. Key capabilities include:

- Dynamic turbine adjustments to maximize energy capture
- Predictive maintenance to prevent failures and extend component life
- Continuous AI model refinement for improved efficiency
- Stable performance under highly variable wind conditions

By combining **realtime insights** with **AI-driven decision-making** and **precise actuation**, the system ensures turbines operate at peak efficiency while reducing mechanical stress and maintenance requirements.

/ Solution Key Features

Smart Data Selection. Transmit Only What Matters.

aicas Edge Data Management ensures that only relevant, event-driven data is transmitted. Unlike conventional SCADA or cloud-based systems that send all collected data to the cloud, aicas performs data recognition and selection directly on the turbines at the edge.

RESULT: Transmitted data can be reduced to less than 10% of the total collected, enabling more focused analytics at the backend.

/ Solution Components

- Edge AI-powered turbine control systems
- aicas Edge Data Management for realtime, AI-driven sensor processing
- Predictive control algorithms to optimize pitch, yaw, and generator output
- Wireless transmission of key operational insights to central teams
- Integration with maintenance scheduling and energy management systems

/ Results & Benefits

Increased Energy Output, Lower Maintenance Costs, Maximized ROI

- **Maximizes energy production and profitability**
- **Reduces unplanned downtime** and mechanical failures via predictive control
- **Enables proactive maintenance**, lowering costs and extending component lifespan
- **Improves resource allocation** and operational planning
- **Continuously enhances efficiency** through AI-driven model learning
- **Delivers measurable business impact:** more uptime, yield, and ROI

Get in touch with us to learn more about our solutions!

aicas GmbH
Emmy-Noether-Str. 9
76131 Karlsruhe, Germany

Web: <https://www.aicas.com>
Email: info@aicas.com
Phone: +49 721 663 968 0

**Sign up
for our
Newsletter!**

