ENERGY AND UTILITIES

Wind turbines

Gearbox and bearings warn weeks ahead in vibration and oil debris, long before temperature rises and the turbine stops.

Status: In operation

The five failures that matter

#	COMPONENT AND FAILURE	SIGNALS	TYPICAL WARNING	TENEURO
1	**Gearbox**: bearing and gear damage Surface fatigue starts in the high-speed and planetary bearings and on gear teeth. Debris spreads the damage through the gear train well before temperature rises.	High-frequency vibration (envelope, gear-mesh orders), oil debris particle count, oil and bearing temperature, active power.	Weeks to months with vibration and oil debris; days if only temperature is watched.	Yes. Accelerometers and acoustics where there is no CMS or the CMS is old. Oil analysis only with a dedicated sensor.
2	**Main bearing**: wear and spalling Heavy, variable rotor loads and poor lubrication wear the rolling surfaces until material flakes off (spalling). The damage grows slowly.	Bearing temperature against load and ambient, low-frequency vibration, axial displacement.	Months, but the vibration signal at low speed is weak.	Yes. Low-frequency sensors, read with care.
3	**Generator**: bearing wear Drive-end and non-drive-end bearings wear from lubrication loss, misalignment and shaft currents that mark the raceways.	Vibration, bearing and winding temperatures, current imbalance, converter alarms.	Weeks for bearings; days for electrical events.	Yes. Vibration and acoustics. The electrical side comes from the turbine SCADA.
4	**Pitch system**: hydraulic leaks, sensor faults Leaks and accumulators losing pre-charge slow the blade response; a faulty angle sensor makes the blades disagree. Pitch is the aerodynamic brake, so these faults also matter for safety.	Pitch angle deviation between blades, accumulator pressure and recharge time, pitch alarm frequency.	Days to weeks.	No. Usually not needed: 10-minute SCADA data and alarms are enough.
5	**Converter**: cooling failure Clogged filters, worn pumps or fans and coolant loss reduce heat removal. The converter derates or trips, and the power modules age faster.	Coolant and power module temperatures against load and ambient, derating events, alarm frequency.	Days to weeks.	Partly. Pump and fan vibration and noise. Temperatures come from the turbine controller.

Also relevant: Blades: leading-edge erosion, cracks, unbalance and ice; Yaw system; Converter power modules (IGBTs).

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What we usually find in the plant, and how we read it

SYSTEM	VIA	LEVEL	PREREQUISITE
AVEVA PI	PI Web API	**Native**	Read access to the customer's PI server.
Vibration CMS with data in AVEVA PI	AVEVA PI	**Native**	
Bently Nevada System 1	OPC or Modbus	**1-day activation**	
Siemens Gamesa SCADA	OPC UA	**1-day activation**	Customer OPC UA interface active. Over IEC 60870-5-104 the link is project-based.
Nordex SCADA	OPC UA Customer Interface	**1-day activation**	OPC UA customer interface purchased. With OPC XML-DA or IEC 60870-5-104 the link is project-based.
VestasOnline Business	OPC UA or ODBC	**1-day activation**	OPC UA or ODBC already licensed. Otherwise project-based, as access depends on the OEM service contract.
ENERCON SCADA	Third-party interface agreed with the OEM	**Project-based**	

Where predictive maintenance does not pay off

- Small, old turbines close to end of life or repowering.
- Sudden electronic failures with no precursor.

There, good preventive maintenance costs less. We will tell you before we start.

Standards we work with

IEC 61400-25 — Turbine information model and communication; each OEM implements it differently, so tags are mapped site by site.
ISO 16079-2 — Condition monitoring and diagnostics of the wind turbine drivetrain.
ISO 20816-21 — Vibration evaluation for horizontal-axis wind turbines: nacelle, tower and drivetrain.
ISO 14224 — Taxonomy of components and failure modes behind the Sibilla ontology.
RDS-PP (VGB-S-823) — Plant designation system for wind farms, used to map tags to components.

Warning times are indicative orders of magnitude from literature and practice: they depend on the duty profile and are validated on your fleet. Last updated 2026-10-03.

Next step: put your plant forward for a pilot — info@plasmiam.com · https://www.plasmiam.com/en/assets/wind-turbines

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