ebs group

Energy, management, control.

Three products, one wind turbine.

ecore, enhance, egate. INSIDE THE WIND TURBINE.

The technology stack for wind turbines.

A wind turbine is a distributed system. Across hub, nacelle and tower, energy, management and control must work together precisely. That is exactly what our technology stack is built for: **enhance stores, egate manages, ecore controls.** The diagram shows where each product sits.

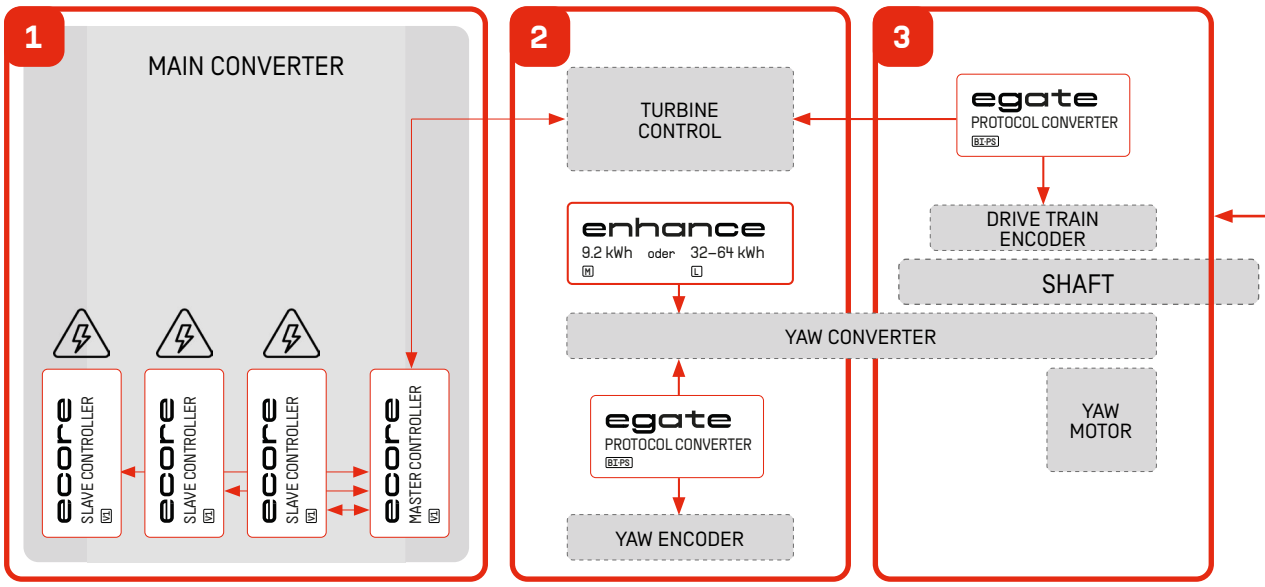
Control.

Real-time is non-negotiable. The main converter, pitch and turbine control demand deterministic response in the microsecond range. **ecore is the control platform** that delivers it — FPGA-based and proven in series production.

- → **ecore** provides highly reliable control of the main converter. Industrially deployed, integrable via Simulink code generation.
- → **ecore** optionally handles real-time pitch control. FPGA platform, cycle times under 100 µs.

ecore MASTER CONTROLLER V1

ecore SLAVE CONTROLLER V1



Energy.

Energy at the right place, at the right moment. Pitch emergency power, DC-link backup, black start and yaw supply. All from one scalable battery system. **enhance** is the energy, **egate HV** is the matching BMS and the only system qualified for operation on the SINAMICS S120.

- → **enhance L** supplies energy for active yaw control.
- → **enhance M** (9.2 kWh) or enhance L (32–64 kWh) connect directly to the converter's DC link. No separate power converter. Instant response to grid events.
- → **enhance HV** supplies the energy. A compact HV battery system in series production. Qualified for the harsh environment of the hub.
- → **egate HV** is the BMS master and the only BMS qualified for operation on the SINAMICS S120. With its own voltage control algorithm and certified for 4,000 m altitude.

enhance 9.2 kWh M

enhance 32–64 kWh L

enhance BATTERY SYSTEM HV

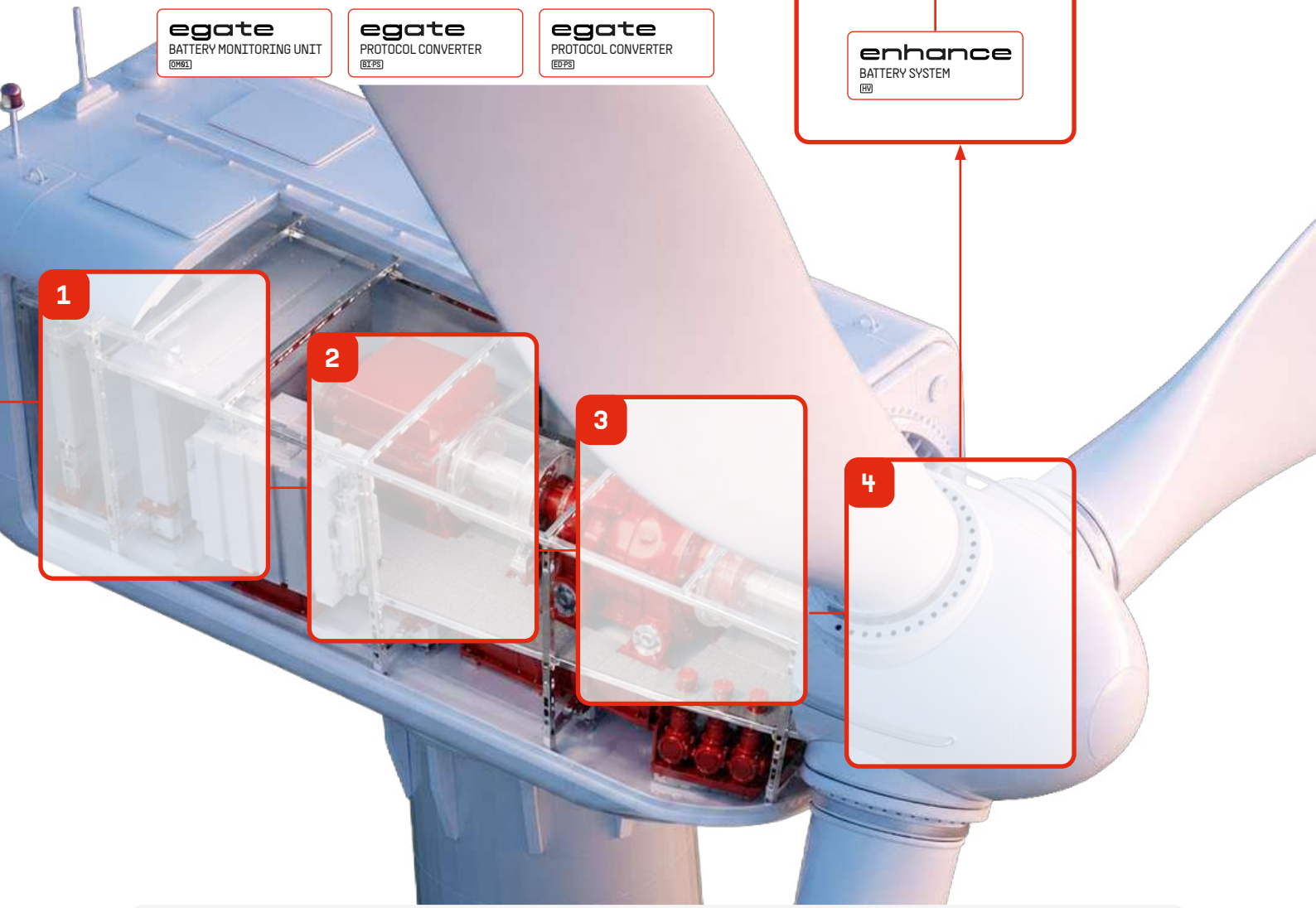
egate BATTERY MANAGEMENT SYSTEM HV

Management.

The critical path runs between sensor and controller. Cell states, pitch and speed signals must be transmitted safely and protocol-compliant — without latency, without data loss. **egate** handles that. As a **BMU** at the cell level and as a **Protocol Converter** for safe encoder integration via BiSS/EnDat.

→ **egate BMU** monitors at cell level and balances. Over 10,000 of these systems are in operation worldwide.

→ **egate BiSS / EnDat** convert the signals from the rotary encoders. They transmit safe data via PROFINET/PROFIsafe to the higher-level controller.



WHY ebs group KNOW-HOW MATTERS

→ **Black-start capable.** Our enhance battery systems start the turbine without external grid power. This enables self-supply, island operation and grid forming. The turbine becomes an active building block in grid restoration.

→ **Built for harsh environments.** Operating altitude up to 4,000 m, wide temperature range, surge resistance up to 6.4 kV (enhance), full EMC qualification. Certified to UN 38.3 and CE.

→ **PROFINET as standard — other interfaces available.** PROFINET is our default connection. Other common industrial interfaces are supported: PROFIsafe, EtherCAT, CAN as well as encoder-side BiSS-C, EnDat 2.2 and SSI.

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Have questions? We are happy to provide more information. Visit ebs-group.io/en or send us an email – our team is ready to discuss your project with you.

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