

Optimize Renewable Energy Asset Operations

Ovation™ Green Software and
Automation Solutions



EMERSON™

Increase Production and Deliver Low-Cost Clean Energy

Optimize renewable energy asset operations and improve annual energy production with Ovation™ Green: an innovative, reliable and robust portfolio of purpose-built software and automation solutions.

The Ovation Green portfolio leverages our industry-leading Ovation automation platform and deep power industry and renewable energy expertise. The new extension of our power-based control architecture focuses on the emerging green energy market, providing simplified renewables automation to help power producers build and scale sustainable operations.

Unlimited access to real-time and historical operations information from the Ovation Green platform empowers owners and operators with greater visibility and control of renewable assets across the enterprise. Our data-driven solutions provide actionable intelligence that drives faster, more informed decisions to increase availability and reliability while reducing operations and maintenance costs.

We continually advance our software to evolve with rapidly changing technology and markets, allowing for growth in a disciplined, balanced way. Our adaptive technology easily scales from a single asset to a renewable fleet, enabling secure and seamless integration of clean energy into a smarter grid.

Backed by comprehensive, end-to-end support programs from a globally trusted advisor with local networks, Ovation Green software and solutions enable customers to increase production and deliver low-cost clean energy.



Renewable Asset Management and SCADA Software

Own your data to see, save and produce more

Emerson's Ovation Green renewable asset management and SCADA software provides clear operational visibility across a portfolio of sustainable energy generation and storage assets.

Emerson's scalable software reduces complexity challenges by enabling efficient management of single or multiple assets independent of the equipment manufacturer or varying system types and vintages.

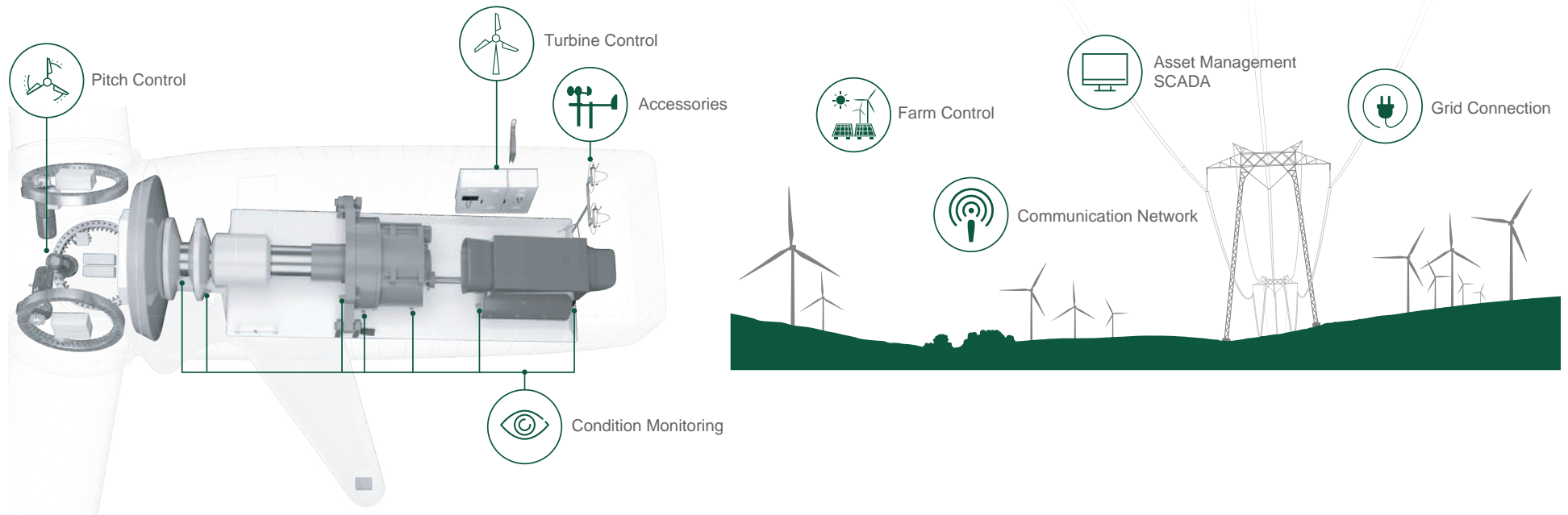
Secure, standardized access to a comprehensive set of centralized, unfiltered data at any time from anywhere provides greater insights into equipment health and optimization opportunities.

Full access to operations information enables owners or operators to anticipate maintenance needs, enabling quick and confident decision-making to avoid costly problems.

Results -

- Maximizes higher annual production
- Increases revenue
- Reduces costs





Comprehensive, Integrated Wind Solutions

Gain higher revenue by improving turbine availability and extending operating life

Emerson has been a leader in wind automation solutions since 1969, with control designs for over 350 wind turbine models, compatible communication drivers for more than 750 wind turbine models and an installed base greater than 60,000 systems worldwide. Our world-class power generation capabilities are amplified by innovative software, adaptive technologies and deep market expertise that help optimize performance and provide unsurpassed reliability.

Ovation Green wind solutions enable you to expertly manage wind turbine and farm operations for reliable delivery of low-cost carbon-free energy. In addition to our broad portfolio of OEM technologies, we serve the fast-growing aftermarket segment by offering cost-competitive retrofit solutions that extend turbine operational life and increase annual energy production.

Every automation strategy is tailored by Emerson's team of wind experts to meet varying project requirements and can include wind turbine control and optimization applications, wind farm or SCADA control retrofits, new asset management software, and condition monitoring software.

Wind Turbine Control and Optimization Software and Services

Improve clean energy production with safe, optimized turbine operations

Emerson offers a suite of Ovation Green wind turbine control software and advanced applications that enable safe, optimized energy production by enhancing turbine operation and increasing performance.

Our tailored solutions are developed by an experienced renewable energy team with deep industry knowledge using intelligent software and a powerful automation platform. Supplement your experts with Emerson wind services including load calculation and optimization, control design, feasibility and wind turbine conceptual studies, and cost-of-energy analysis and optimization.

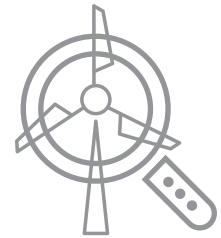


Control Software

- Real-time operation tracking
- Extended cut-out speed
- Yaw control
- Individual pitch control
- Power boost

Advanced Applications

- Online fast Fourier transform (FFT) analysis
- Self-calibrating yaw control
- Automatic rotor imbalance correction
- Operating life estimator
- Online diagnostics





Wind Turbine Control Retrofits

Cost-effectively increase capacity

Emerson's holistic approach to wind turbine retrofits provides wind owners and operators full visibility of their data and a vivid view of wind-turbine operations.

Our innovative, site-specific Ovation Green control and monitoring system retrofit programs for older wind turbines are a quick, safe and cost-effective option to extend their lifespan.

Operating with modern, purpose-built wind-specific software and solutions that provide access to all operating data provides greater insights into equipment health and optimization opportunities, allowing the development of turbine-specific maintenance plans that reduce downtime and costs.

And, by implementing advanced control strategies that are customized to the wind turbine type, operation, location and surrounding environment, owners and operators can produce more energy, resulting in higher revenue for a fraction of the cost of investing in repowering existing turbines or purchasing new ones.

Results -

- **Extends lifespan**
- **Increases availability**
- **Enhances performance**
- **Reduces costs**

Wind Turbine Condition Monitoring

Reduce costs and downtime by predicting the unpredictable

Forecasting upcoming maintenance on older wind turbines can be challenging if the automation systems lack condition monitoring or restrict access to detailed data needed for maintenance planning.

Emerson's Ovation Green wind turbine condition monitoring system with vibration analysis covers all aspects of wind-turbine operations, helping to quickly pinpoint the root cause of an issue before it escalates—enabling faster, more informed decisions.

Our automated condition monitoring software continuously monitors wind-turbine operations using real-time data so impending issues are recognized, diagnosed, and resolved more efficiently.

Each solution is tailored to meet unique individual turbine needs and is adaptable for implementation across a fleet of wind assets.

Results -

- Reduces unplanned service, risk, and costs
- Increases turbine availability and performance





Wind Turbine Electrical Pitch System

Enhance operational safety with pitch-perfect blade angles

Reliable control of wind turbine speed safely reduces stressful loads. This, in turn, lowers costs, extends operating life and increases power output.

Emerson's Ovation Green electrical pitch system automatically and accurately adjusts a wind turbine's blade angle based on varying wind conditions to protect the turbine from high wind speeds, optimizing performance and production.

Our highly robust solutions increase turbine availability and reliability through standard turnkey systems for three-blade turbine models up to 10MW or customized systems for two-blade turbines up to 20MW.

Rotor blades can be pitched collectively or individually to maintain rotor speed within design limits. When the safety system is activated, all blades are placed in a feathering position for maximum protection. The pitch system is powered by an integrated energy storage unit for reliable, continued operation during a grid event.

Results -

- Reduces the effect of stressful loads
- Increases operational safety
- Optimizes performance

Hybrid Renewable Power Systems

Increase grid reliability by expertly managing integrated renewable energy generation and storage

The future of power requires integrated hybrid energy systems where renewable and traditional generation, energy conversion and storage technologies are combined to increase the resiliency and reliability of the grid while helping to balance the supply of clean electricity.

While the benefits of hybrid power systems are clear, bringing them to life is complicated. Integrating many data sources into one system and efficiently managing different generation and storage assets – each with its own control systems – is no easy task.

Emerson software and solutions for renewable assets provide a secure, purpose-built digital automation foundation with multi-vendor and multi-asset interoperability. Our automation platform is a single integrated source for capturing and contextualizing the massive amounts of data generated by renewable operations.

By providing greater visibility through a single, unified view of operations, Emerson software eliminates data siloes, complexity and risk. And as a result, it reduces costs, optimizes financial and energy performance across renewable portfolios and provides operators with more time to focus on driving results, instead of dealing with headaches.



Comprehensive Support

Optimize performance by supplementing your workforce with a team of global industry pioneers with local networks armed with decades of expertise.

Our expert resources can help you dependably define, execute and support an end-to-end lifecycle software and automation strategy for your renewable operations.

Partner with Emerson, a trusted adviser, to develop a comprehensive service and support plan that fits your renewable portfolio needs.

- **Consulting services** combine thought leadership, deep experience and leading technologies to solve high-stakes problems
- **Lifecycle services** provide the expertise, technology, and processes to operate safely, improve reliability and optimize your plant or equipment performance
- **Project services** provide a path to better project performance by reducing complexity, eliminating work and accommodating late change
- **Educational services** help increase your people's performance quality for better plant profitability and keep them up-to-date on automation technologies



For more information visit
www.Emerson.com/Ovation-Green



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