



ARSOS

Automation Suite

Product Overview



greeneaglesolutions.com

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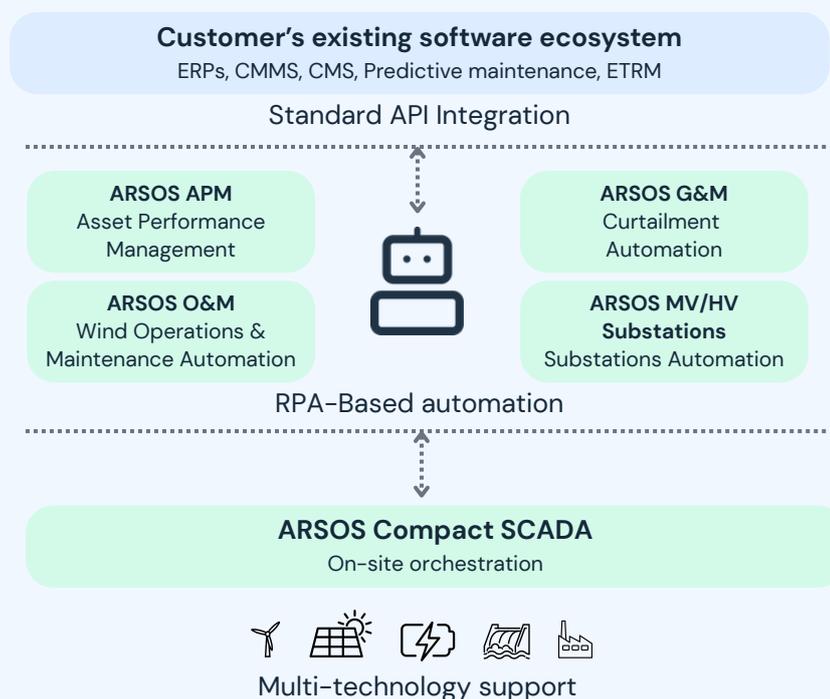
Discover ARSOS Automation Suite

ARSOS Automation Suite is a cloud-based SaaS automation platform that puts your renewable operation on autopilot — delivering real-time monitoring, automated curtailment, and automated fault response without the need for a full-time control room. It scales effortlessly with your portfolio.

Built-in advanced data analytics transform operational data into actionable insights, helping you optimize performance and make smarter, faster decisions.

The platform is designed to meet the highest cybersecurity standards and offers fast, flexible onboarding that stays fully in your control.

ARSOS Automation Suite offers a powerful ecosystem of tools that redefine how renewable energy assets are monitored, operated, and optimized:



Together, these solutions bring full-stack automation to operations & maintenance, grid compliance, market interaction, substation control, and on-site orchestration.

Key Benefits

Reduce Operational Costs and Optimize Market Returns



Fault handling automation

End-to-end fault handling automation, following your pre-defined operation protocols.



Curtailment automation

Automatically applies curtailments based on TSO requests in real-time. Optional manual control.



Substations automation

Centralizes alarm management, synchronizes real-time grid signals, and automates substation-level operations.



No need for a full-time ROCC

24/7 monitoring and execution



Always compliant

It guarantees you'll meet TSO regulatory requirements. Always updated.



Participate in additional markets

Participate in additional markets to maximize revenue.

Compatibility



Multi-technology and multi-brand

Unified monitoring and execution across diverse asset types. Personalized 1-to-1 care for every brand and model.

Cybersecurity



Highest Cybersecurity Standards

NIS 2, ISO/IEC 27001, ENS High Level, SOC 2 type II, IEC 62443, NERC-Compliant.

Effortless Monitoring, Troubleshooting and Reporting



Detailed Real-Time Visibility

You'll have immediate access to what's happening, where, and why.



Uncover Operational Insights

Easily visualize events and signals along a timeline to quickly identify root causes and operational patterns.



Operational KPIs & Reporting

IEC availability & performance, production, alarms, actual vs budget, availability, efficiency, energy losses and energy resource analysis.



Seamless Hierarchical Navigation

Move seamlessly across diverse technologies and complex asset structures.



Custom reports

Connect to ARSOS API OData to create your own custom reports.



Centralized alarms

Centralized alarms from multiple substations and sites into a single ARSOS dashboard.



Local manual control

If needed, you can send manual commands.

Smooth Onboarding & Integrations



Self-Onboarding

Define your own pace. ARSOS allows you to upload your assets, giving you complete control and flexibility over deployment speed.



CMMS Integration

If a reset doesn't solve the issue, ARSOS automatically escalates the issue via email or work order in your CMMS.

What you can do

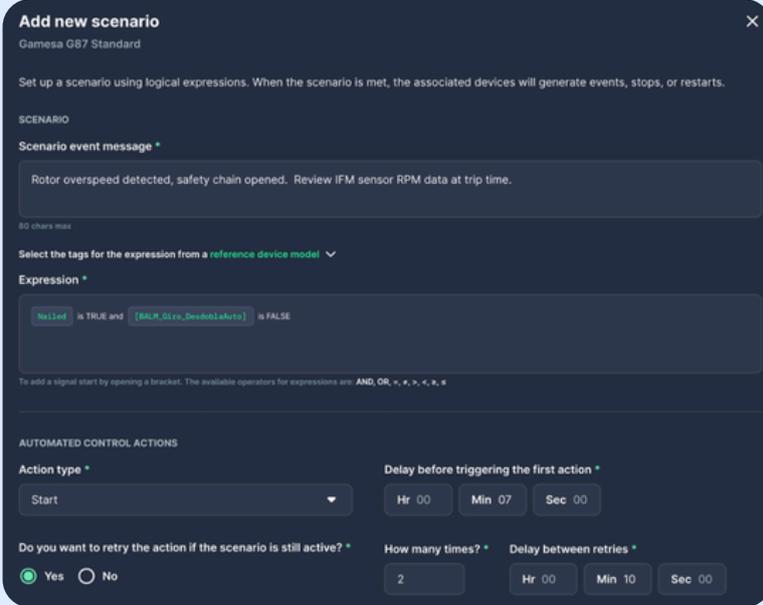
Fault Handling Automation

ARSOS O&M enables complete automation of wind turbine fault handling, eliminating the need for manual intervention and significantly reducing downtime.



How it works

- Configure alarm books and operation protocols based on the alarms. Each protocol will specify wait times, action to take (start, stop and / or notification).
- Assign the customized operation protocol to each turbine. This allows adapting actions (like resets) based on turbine condition (e.g. newly installed, recently repaired), supporting a 1:1 turbine care approach.
- When a fault occurs, ARSOS detects it, analyzes contextual conditions (wind speed, alerts, etc.) and performs the configured action in the operation protocol if conditions are met. For example, performing an automatic reset.
- In critical or complex cases, ARSOS notifies the operator, including a full event log and alarm context to assist with decision-making.
- If a work order is open in the CMMS, ARSOS automatically switches to manual mode; it reverts to automated mode once the work is completed.
- Use ARSOS KPIs and reports to refine operational protocols—boosting efficiency and maximizing returns.

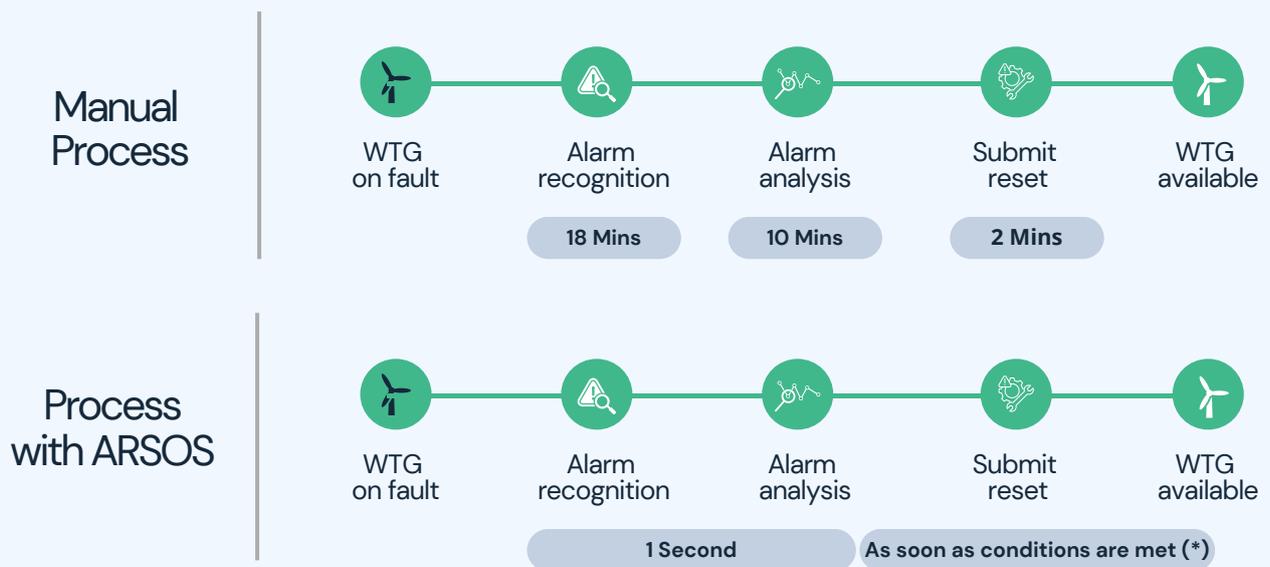


In this example, we can see the configuration of an operation protocol scenario in ARSOS.

When conditions are triggered, ARSOS follows the process.

In this example, it restarts the turbine after 7 minutes if conditions persist, with up to 2 more attempts. This frees operators for complex tasks.

Comparing Fault Handling: Manual Process vs. ARSOS



(*) The system will wait the time specified by the user in the ARSOS Operation Protocol.

Save **30 mins** per reset

Automate up to **80%** of control room activities

Scale without increasing headcount

Measure Results

We provide reports to help our customers gain valuable insights into their wind farm operations powered by ARSOS to understand the benefits and continue optimizing the operation. These reports offer a clear view of:

- Automated Resets: Track the number of automatic resets performed by ARSOS.
- Escalations Management: Monitor the number of notifications submitted via escalations, identifying the specific wind turbines that trigger the most frequent alerts.
- Operational Benefits: Assess the impact of ARSOS by quantifying the additional revenue generated and cost savings achieved.

Wind Turbines Preventive Stop Strategies

Wind turbines experience continuous stress from changing wind conditions, leading to unnecessary wear. ARSOS enables preventive stop strategies that proactively reduce turbine fatigue during inefficient or high-stress scenarios. This helps extend the lifespan of key components and reduces maintenance needs.



These strategies are fully customizable, allowing operators to fine-tune settings for each turbine. By intelligently pausing operation when it would be counterproductive, ARSOS ensures optimal performance and long-term asset health.

Environmental Compliance

As environmental regulations become increasingly stringent, wind farm operators must adapt their operations to comply with evolving laws and guidelines. ARSOS enables the effortless implementation of environmental restrictions without the need for costly hardware upgrades or PLC modifications.

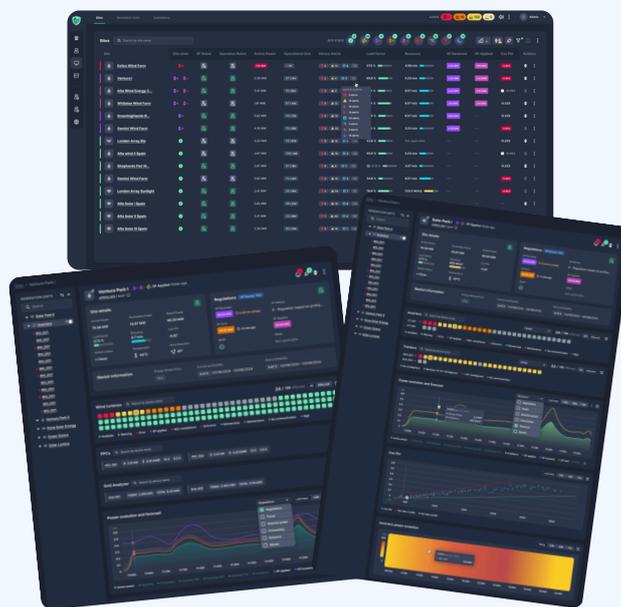


- Bird protection: stop turbine groups in less than 5 seconds.

- The system can be configured to automatically stop turbines when bird migration patterns are detected or when real-time environmental data triggers the protection protocol.
- Bat protection: integrate with detection sensors.

Asset Performance Management

ARSOS APM empowers portfolio managers and asset operators to take full control of their sites, seamlessly and at scale. It offers real-time operational monitoring and next-day performance reporting.



KPI Categories

- **Availability Metrics (IEC):** Planned/unplanned downtime, cause classification, and downtime attribution.
- **Energy Production:** Instantaneous and cumulative active power across devices, sites, and portfolios.
- **Setpoint Compliance:** Comparison of SP received, sent, and applied, with deviation detection.
- **Energy Loss Analysis:** Detection and quantification of production losses—curtailment, faults, or external constraints.
- **Efficiency Metrics:** Performance vs. producible potential, with diagnostics by site, turbine, or component.

- **Resource Forecasting:** Irradiance, wind speed, water flow, and ambient temperature correlations.
- **Forecast Accuracy:** Real-time vs. P10/P50/P90 comparisons to identify deviations and adjust forecasting models.
- **Capacity Factor & Load Factor:** Hourly, daily, monthly performance normalization.
- **Electrical Health:** Cos ϕ , reactive power, voltage, and current profiles.

Visual Tools & Reports

- **Heatmaps:** Inverter-level and transformer-level energy delivery by time of day.
- **Alarm Frequency Charts:** Track recurrent fault types, durations, and associated downtime.
- **Performance Curves:** Scatter plots and histograms of wind speed vs output or irradiance vs generation.
- **Market Impact Views:** Overlay generation with real-time or forecasted market pricing.
- **Forecast Deviation Reports:** Color-coded visuals for forecast misses.
- **Event Timelines:** Chronological incident logs with auto-classified root causes.
- **Map-Based Portfolio Monitoring:** Geographic interface with live KPIs and device status by location.
- **Downtime Distribution:** Pareto charts for downtime by root cause and severity.

Uncover Operational Insights

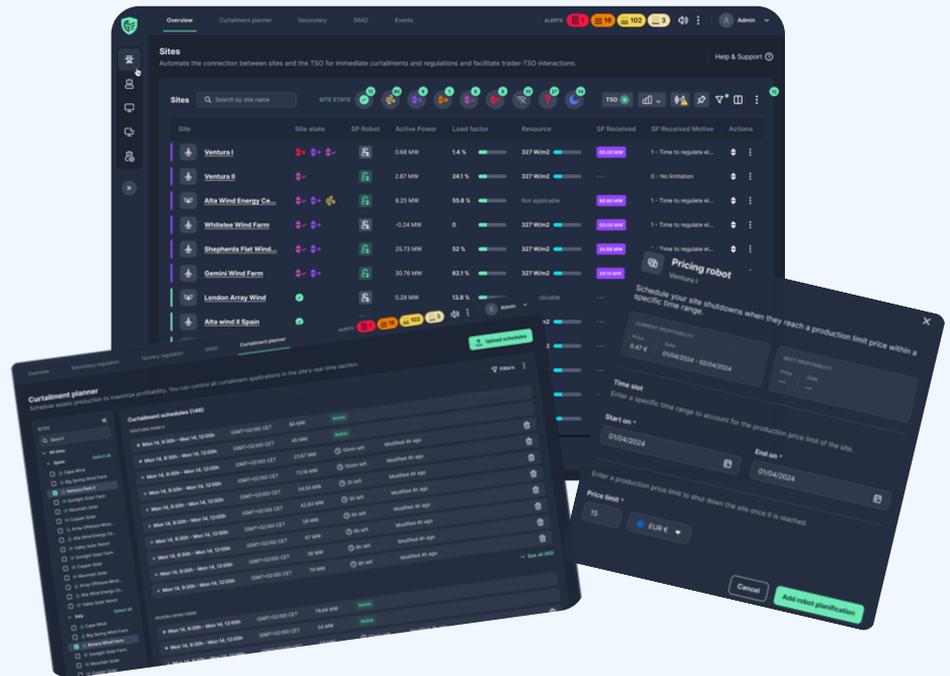
Easily visualize events and signals along a timeline to quickly identify root causes and operational patterns.



Grid & Market Optimization

ARSOS G&M transforms regulatory complexity into executable workflows—automating curtailments, ensuring continuous compliance, and unlocking full access to TSO-driven opportunities like intraday, adjustment, and balancing services.

ARSOS connects directly to energy market platforms and TSOs, processing real-time grid requirements and pricing signals.



Automated Energy Market-driven Curtailments

ARSOS integrates with energy market platforms to automate the bidding process, optimizing bids based on real-time conditions.



- **Real-Time Market Integration:** ARSOS adjusts power output in response to market fluctuations, ensuring optimal market participation in day-ahead, intraday, and balancing markets.
- **Price-Based Curtailment:** ARSOS can automatically curtail energy production during negative price periods, preventing financial losses and enhancing profitability.
- **Forecast Adjustments:** In cases where third-party energy forecasts are inaccurate, ARSOS adjusts forecasts to better reflect real-time conditions. Operators can select different percentiles of the energy forecast, based on load factor conditions, to improve accuracy and reduce penalties from market deviations.

- **Curtailment Planner:** Users can implement curtailment plans directly from CSV files, allowing operators to schedule and manage curtailments in advance, optimizing energy production based on anticipated market conditions.

Participation in Grid Balancing & Ancillary Services

With increasing renewable energy penetration, grid balancing services have become critical to ensuring grid stability. ARSOS offers a fully automated approach to managing these services, ensuring compliance with TSO requirements.



- **Automated Curtailments:** Responds instantly to grid operator curtailment requests, ensuring that excess energy generation is curtailed efficiently and in compliance with TSO instructions.
- **Frequency Response:** ARSOS adjusts generation output in real-time to help balance supply and demand, ensuring grid stability and compliance with TSO regulations.
- **Voltage Control:** Continuously monitors voltage levels and adjusts reactive power to stabilize the grid as required by the grid operator.

Substation Automation

Bring complete digitalization and automation to your Medium and High Voltage substations. ARSOS centralizes alarm management, synchronizes real-time grid signals, and automates substation-level operations. It also ensures that substations can interface effectively with TSOs and grid infrastructure, meeting compliance requirements while enabling advanced operational control.

- Unify the monitoring and control of all MV/HV substations under a single platform.
- Centralize alarm ingestion and notifications of relevant incidents across substations.
- Enable substation operations such as switchgear commands (open/close), transformer tap changes and breaker operations.
- Eliminate the need for dedicated ROCC infrastructure with ARSOS acting as a virtual Substation Control Center.

Resilient On-Site Automation & Control

Through ARSOS Compact SCADA software you can connect ARSOS with your on-site systems—making automation and control resilient, even when connectivity fails.

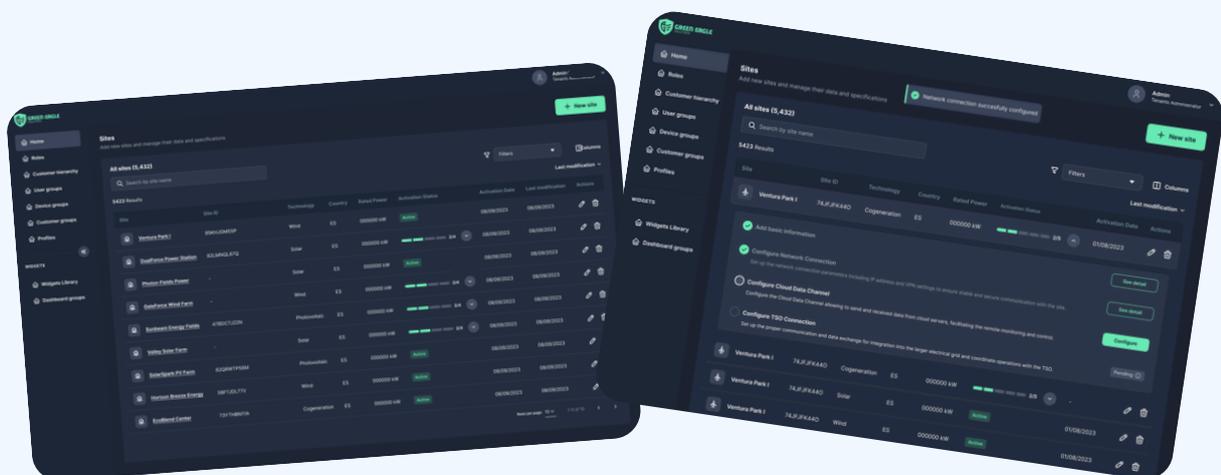
It is generally installed on edge and acts as a local orchestrator across wind, solar, BESS, and substations, connecting PPCs and enabling seamless multi-technology coordination at the site level. It runs lightweight SCADA visualizations locally and executes automation protocols in real-time, reducing dependence on cloud or OEM SCADA systems.

- Enable fault resets, curtailments, and setpoint dispatch even under cloud or VPN loss.
- Aggregate telemetry and control across hybrid sites (Wind, Solar, BESS, MV/HV).
- Replace or extend OEM SCADA systems with an on-premises lightweight SCADA UI.
- Store and forward telemetry to maintain data continuity during communication outages.

Setup

Easy and Autonomous Setup Process

The setup process is done through an easy step by step onboarding wizard where you'll be able to create new sites and configure all its information.



Cybersecurity

Adhering to the Highest Cybersecurity Standards

ARSOS complies with the highest cybersecurity standards and holds certifications including SOC 2 Type II, ISO/IEC 27001, NIS2, and ENS. It is also NERC compliant.

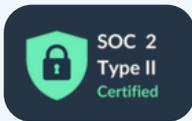


NIS 2 is the EU-wide legislation on cybersecurity. It provides legal measures to boost the overall level of cybersecurity in the EU.



ISO/IEC 27001 is the world's best-known standard for information security management systems (ISMS). It defines requirements an ISMS must meet.

ISO/IEC 27001 promotes a holistic approach to information security: vetting people, policies and technology. An information security management system implemented according to this standard is a tool for risk management, cyber-resilience and operational excellence.



NIS 2 is the EU-wide legislation on cybersecurity. It provides legal measures to boost the overall level of cybersecurity in the EU.



IEC 62443 are international standards that provides guidelines for securing industrial control systems (ICS) and operational technology (OT) networks, covering topics like risk assessment, security policies, network security, access control, and incident management. We have the following certificates: 2-4:2020, 3-3:2020, 4-1:2019, 4-2:2019.



NERC standards are a set of regulations developed by the North American Electric Reliability Corporation (NERC) to ensure the reliability, security, and stability of the bulk power system (BPS) in North America.

**Would you like to see
ARSOS in action?**

Let's Talk!

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