GE Enterprise SCADA for Wind
Cybersecure, Real-Time Asset Monitoring and Control

Your Challenge: Lacking unified view of fleet status with cybersecure remote control

The average wind turbine trips once or twice a week. Some of the leading causes of lost revenue include unplanned downtime, unnecessary routine maintenance, emergency repairs, lost availability, excess inventory, and lack of workforce productivity.

Our Solution: Advanced digital application to achieve secure, real-time visibility and control of your wind farm equipment

Whether you’re monitoring your ISP/OEM providing contractual services, starting to build a remote monitoring center, or operating an expanding fleet, GE Renewable Energy’s Enterprise SCADA (eSCADA) is designed to meet your needs.

A remote monitoring and operations strategy is the first line of defense against emerging issues at a wind farm and is key to aligning operations with business needs.

- Gathering real-time alerts from a multitude of SCADA, BOP, grid, and weather monitoring systems.
- Prioritizing responses based on potential impact.
- Remote troubleshooting of alerts or trips, and escalations to field services teams.
- Reporting and knowledge management.
- Compliance with critical energy infrastructure regulations.

GE Renewable Energy’s eSCADA is designed to provide industry-leading remote operations and fleet management. eSCADA, part of GE Renewable Energy’s Digital Wind Farm solutions, makes it easy to securely achieve real-time visibility and control of your wind farm equipment. It offers a consistent user experience across multiple OEM technologies, as well as improved workflows. This enables enhanced operator productivity and improved return-to-service times, while meeting the ever-changing cybersecurity regulations.
Key Benefits

eSCADA allows customers to:

• Gain visibility to current fleet performance across multiple turbine technologies from geographically diverse locations.
• Prioritize alert response, shorten resolution time, and enhance operational efficiency to improve return-to-service times.
• Automate response to alerts based on programmable fault handling procedures.
• Promote open and efficient communication across all facets of operations and field services.
• Enhance cybersecurity posture.
• Live connectivity and control of multiple OEM assets in geographically diverse locations.
• Single user experience eliminates the need to learn/use numerous on-premise SCADA systems.
• Leverage tools to operationalize remote operations:
  — Knowledge management of handling procedures with standardization across users.
  — Documentation and tracking of operation center recommendations/communications to field services teams.

• Scale and simplify with the unified platform experience across GE’s Digital Wind Farm solutions.

Measurable Results

The implementation of GE’s Enterprise SCADA solution on more than 15,000 wind turbines across the world has enabled the GE Remote Operations Centers to achieve:

• 20% faster return-to-service, resulting in 0.5% higher availability for our customers.
• 15% improvement in remote operation center productivity.

The GE Advantage

• Customizable automated reset capability.
• Improved operations productivity so that each operator can handle more assets.
• Low startup and maintenance costs compared to on-premise/data center-based solutions; add new sites, users easily.
• Knowledge management around best practices and fault handling procedures to shorten troubleshooting time.
• Unified experience, integrated with GE’s Digital Wind Farm suite of solutions.

Product Tiers

eSCADA is offered in three different packages to suit your unique business needs—whether you monitor or manage a single wind farm or a large multi-OEM fleet.

<table>
<thead>
<tr>
<th>Description</th>
<th>eSCADA Standard</th>
<th>eSCADA Control</th>
<th>eSCADA Automate</th>
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</thead>
<tbody>
<tr>
<td>eSCADA Standard</td>
<td>• Read-only access to eSCADA interface customized to show the customer’s sites and units</td>
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<tr>
<td>eSCADA Control</td>
<td>• Ability to create and view work action cases in response to alarms and events</td>
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<td></td>
<td>• Users can send commands and control troubleshooting</td>
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<tr>
<td>eSCADA Automate</td>
<td>• Highest level of system access</td>
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<td></td>
<td>• Allows the user to fully control action response and automate resets</td>
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<td></td>
<td>• Customer can store their own fault handling procedures</td>
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<table>
<thead>
<tr>
<th>Capability</th>
<th>eSCADA Standard</th>
<th>eSCADA Control</th>
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<tbody>
<tr>
<td>Fleet dashboard</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Fleet/site/turbine drill-down view</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>Alert queue</td>
<td>✔</td>
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<tr>
<td>Manual resets and turbine control</td>
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<tr>
<td>Automated resets</td>
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<td>✔</td>
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<tr>
<td>Knowledge management – fault handling procedures</td>
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<td>✔</td>
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<tr>
<td>Field communication tools – work actions, special instructions, call-out rules, email notifications, contact info management</td>
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Product Features

Connectivity
- Numerous connectivity protocols to enable data connections to SCADA systems or assets across multiple wind turbine OEMs.
- Low-cost edge device, providing secure connectivity and remote management capability.

Visibility
- **Dashboards:** View fleet-wide metrics that highlight key operational aspects such as aggregate production, availability, capacity factor, and network connectivity and asset operational status.
- **Fleet-to-turbine drill down:** Investigate current performance with fleet view, park view, and turbine view. See KPIs and current alarms.
- **Alert queue:** View real-time alerts in queue awaiting disposition, reset, or escalation. Alerts are customized to direct users to assets in the fleet that are actionable and require a technician’s attention.
- **User experience:** Dark color scheme available to lower eye strain for operators.
- **Task scheduler:** Configurable reminder service for future planning of necessary operational tasks.

Control
- **Manual turbine control:** Stop, start, reset a single turbine or a whole wind farm.
- **Automated commands:** Following an automated safety check to ensure nobody is at the turbine, allow remote commands to be executed automatically based on fault code and customer-configurable settings.
- **Remote testing:** Perform battery tests or similar available actions on select turbine types that are scheduled on a one-time or recurring basis using a task scheduler to alert the operator.

Field Services Communication
- **Simplified notification toolset:** Easy-to-use methods to communicate with field services personnel for work actions/escalations.

- **Centralized management:** Integrated case management system that can be used for recording user work actions against assets, for storing special instructions about sites, logging site technician notifications about on-site maintenance, or any other asset-related activities. Customizable email templates, contact lists, and call-out procedures.
- **Automated case management:** Enhance operator productivity and reduce case management workload by detecting the status of an asset and automatically determining when a case can be safely closed.
- **Bi-directional communications:** Functionality to support communications responses from field teams to remote operations center.

Knowledge Management
- **Fault handling procedure management:** Store and maintain fault management documents in a controlled, centralized location to maintain continuity across all users.
- **Historical records:** Access asset fault history, work actions, special instructions, and logs. Search and analyze past cases and export case data.

Security
- **Focus on secure communications:** Data flows one way from secure perimeters out to Cloud via secured VPN tunnel. All actions are issued from within secure perimeters, and command requests are pulled by zones of higher levels of trust from a zone of a lower trust level (in accordance with NERC/CIP best practices).
- **Access control:** Customize user access permissions to individual wind farms, assets, specific pages, or even specific features within a page.
- **Identity provider integration:** Access to eSCADA and the entire Digital Wind Farm suite of applications is granted through a security interface that integrates directly with one or more customizable Identity Providers (IdP).
About GE Renewable Energy

GE Renewable Energy is a global leader in advanced technology focusing on wind, hydro, and solar power generation services for a cleaner, more productive world. Combining onshore and offshore wind, hydro and innovative technologies such as concentrated solar power, GE Renewable Energy has installed more than 400 GW capacity globally to make the world work better and cleaner. Our tailored solutions range from single component to full turnkey power plants.