Renewable Energy Automation Solutions
A Secure Investment in the Future
You’ve made a significant investment in your renewable energy site. Maximize your return by optimally managing those assets.

Emerson is the leading global automation supplier for the power industry. We have a rich history of providing proven solutions for a variety of energy generating assets including coal-fired, combined cycle, and cogeneration units. For the past 20 years, we have built upon our successful fossil-fuel foundation to develop automation strategies for green energy sites.

As the leading power automation expert, Emerson is the only vendor with the people, tools, and techniques to fully evaluate your renewable energy needs and provide you with a low-risk solution.

We have perfected strategies that expertly control everything from individual plant components to the most complex power generation processes. An integral part of our results-oriented approach is the seamless integration of geographically remote units into a unified automation system.

Whether it is control of a single energy source or management of an entire generation fleet, Emerson provides a total solution from local field devices, to supervisory control and data acquisition, distributed control, and digital bus architectures.

Emerson’s expertise expands beyond the typical supply of control products; we are known world-wide for our ability to manage the entire scope of a project that includes design, build, installation, and best-in-class long-term service. Our support programs will keep your plant running at peak performance.

Protect your green energy investment by collaborating with Emerson, an experienced automation supplier, to meet renewable challenges head-on:

<table>
<thead>
<tr>
<th>Time to Market</th>
<th>Our demonstrated experience will help to expedite design, construction, installation, and outage activities, thus enabling you to immediately generate power in the most cost-effective manner.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fleet Management</td>
<td>Emerson’s automation solution centralizes management of all your assets into a single unified system. Our SCADA system provides interoperability between equipment within a single plant, between similar sites, or across geographical areas to encompass all of your power generating facilities.</td>
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<tr>
<td>Safety &amp; Security</td>
<td>Our strategies enable safe and secure plant operation by complying with industry standards. Emerson’s goal is to protect your renewable assets from cyber or physical attacks and your people and equipment from harm.</td>
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<tr>
<td>Risk Mitigation</td>
<td>Emerson is the logical choice for a low-risk automation provider. Each green energy solution follows a disciplined process that incorporates proven techniques that are systematically implemented by our power generation specialists. Our proven approach increases your return on investment with minimal risk.</td>
</tr>
</tbody>
</table>
Over 20 years of Global Renewable Automation Experience

- **Solar**
  - Acconia Solar Power Nevada One – Nevada, USA
  - NextEra Energy Resources SEGS III through IX – California, USA
  - FPL Martin Next Generation Solar - Florida, USA
  - Iberdrola Energia Solar De Puertollano – Spain
  - Acconia La Risca, Majadas de Tiétar, Palma del Rio – Spain
  - SAMCA La Florida, La Dehesa - Spain
  - Valoriza Energia/Solel Labrija-1 - Spain

- **Geothermal**
  - ORMAT Ormesa – California, USA
  - San Jacinta Tizate - Nicaragua

- **Wind**
  - PGE Biglow Canyon – Oregon, USA
  - ENEL Green Power Valle de l’Arce - France

- **Hydroelectric**
  - AD ELEM (7 units) – Macedonia
  - RUSHydro (54 units) – Russia
  - SCE Big Creek – California, USA
  - SCE&G (22 units) - S. Carolina, USA
  - Dominion Bath County – Virginia, USA
  - KOSEP Muju, Yecheon - Korea
  - Grant County PUD (2 units) - Washington, USA
  - UHE Dnestrovskaya - Ukraine
  - UHE Dnieper River (100 units) - Ukraine
  - Hydro Dolomiti Enel Avio - Italy
  - GAMEK Capanda - Angola
  - EGAT Lam Ta Khong - Thailand

- **Biomass**
  - AES Greenidge - New York, USA
  - Buena Vista – California, USA
  - Bay County Services - Florida, USA
  - C&T Airasca, Termoli - Italy
  - China Everbright Suzhou - China
  - Covanta York – Pennsylvania, USA
  - Green Earth Fuel Kinder Morgan – Texas, USA
  - Hitachi Zosen (6 sites) - Japan
  - Duke/Ever-Green Energy St. Paul– Minnesota, USA
  - Elektrownia Stalowa Wola – Poland
  - Multitrade Rabun Gap - Georgia, USA
  - PSNH Schiller - New Hampshire, USA
  - SWA Palm Beach - Florida, USA
  - Xcel Bay Front - Wisconsin, USA
  - Kaohsiung - Taiwan

Emerson’s innovative technology, process expertise, and long-term support ensures the most efficient and cost-effective integration of your green energy assets.
Comprehensive Solutions

Emerson
The Secure Choice for Power Expertise

Plant Types

• Wind Farms
• Solar Fields
  – Photovoltaic
  – CSP parabolic trough
  – CSP central receiver
  – Stirling engine
• Hydroelectric Plants
  – Impoundment dam
  – Pumped storage
  – Diversion (run of the river)
• Geothermal Plants
  – Binary cycle
  – Dry steam
  – Flash steam
  – Heat pumps
• Biomass Plants
  – Ethanol
  – Methane gas
  – Municipal waste
  – Wood waste
• Hydrokinetic Plants
  – Tidal action
  – Ocean current
  – Wave energy

Plant Control and Monitoring Systems

- Distributed control system (HMI, controllers, network, etc.)
- Plant historian and report generator
- Electronic documentation
- Integration with third-party systems and Intra-Internet
- Fieldbus solutions (HART, FOUNDATION™ fieldbus, Profinbus®, DeviceNet™, etc.)

Plant Control and Monitoring Applications

- Wind farm applications
  – Nacelle
  – Individual blade pitch control
- Solar field applications
  – Mirror assembly positioning
- All major hydroelectric plant applications
  – Pond control
  – Hydraulic pumping units
  – Wicket gates and outlet chambers
  – Blade pitch control for hydro turbines
- Geothermal plant applications
  – Brine injection
- Applications common to various plant types
  – Binary cycle
  – Steam turbine
  – Heat exchanger
  – Economic dispatch
  – Energy management
  – Excitation system
  – Generator synchronization

Intelligent Field Devices

- Pressure, temperature, flow, and level transmitters
- Liquid/gas analyzers
- Valves and valve actuators
- Control system intelligent electronic device (IED) integration

Intelligent Device Management

- Health monitoring
- Calibration
- Configuration
- Audit trails
- Vibration monitoring
- Asset management

Fleet Management and Optimization

- Fleet-wide integration (multiple plants)
- Enterprise historian and report generator
- Fleet-wide asset management and reliability programs
- Performance monitoring
- Process loop analysis and tuning
- Economic optimization

Electrical and Auxiliaries

- UPS, power conditioning, and distribution
- Motors
- Couplings
- Gear reduction drives
- Backup power generators
Energy Management and Online Plant Modeling Optimization
- Equipment performance modeling
- Contingency analysis and load shedding
- Remote breaker control
- Synchronization

Engineering Services and Lifecycle Support
- Front-end engineering and design (FEED) capabilities
- Installation, commissioning, and startup services
- Long-term maintenance
- Optimization programs
- Educational services
- Integration services
- Security assessments

Plant Optimization
- Unit response optimization
- Economic optimization
- Process loop analysis and tuning

Simulation
- First-principle
- Algorithmic
- Tie-back
- Virtual technology
**Digital Automation Architecture**

PlantWeb is an automation architecture that delivers asset management, process control, and management execution through intelligent field devices, industry standard platforms, and integrated modular software. It provides seamless connection to widely adopted digital ‘smart’ device communication protocols including HART, FOUNDATION fieldbus, Profibus DP, and DeviceNet.

**Process Control System**

The Ovation™ expert control system is a product of Emerson’s four decades of experience in process control for the power generation industry. Ovation utilizes commercially available, off-the-shelf technology to provide a powerful and secure architecture while allowing your system to easily progress with rapidly advancing computer technologies. Ovation provides a seamless interface with the most widely adopted bus standards allowing you to incorporate smart device technologies into your process. Ovation’s embedded advanced algorithms and proven industry-specific control routines assure that you can optimize your operations to maximize efficiency, productivity, and profitability.

**Asset Management**

The AMS Suite of applications is a core component of the proven PlantWeb digital plant architecture. AMS Suite powers PlantWeb by using predictive intelligence to improve availability and performance of production assets, including mechanical equipment, electrical systems, process equipment, instruments, and valves. The AMS Suite: Intelligent Device Manager provides a powerful tool for predictive diagnostics, documentation, calibration management, and configuration of intelligent devices. With the AMS Device Manager, the Ovation expert control system offers seamless communication with intelligent field devices and bus technologies to deliver the power of predictive intelligence.

**Simulation**

Scenario™ simulation provides operator training, procedure development, control logic testing, and an engineering test bed for increased plant efficiency and enhanced operator performance.

**Process Optimization**

Emerson’s suite of SmartProcess™ engineered optimization technologies use fuzzy logic, advanced analytics, and model predictive control for adaptive improvement. SmartProcess helps utilities achieve optimized equipment performance for economics, temperature control, efficiency, and overall continuous improvement.

**Wireless Solutions**

Secure and infinitely configurable, Emerson’s self-organizing network ensures an adaptive, flexible approach to wireless. Emerson’s Smart Wireless strategy ensures the greatest network integrity by allowing devices to communicate with each other with no single point of failure.
SCADA Solutions
Emerson’s Ovation SCADA system features state-of-the-art monitoring, control, and diagnostic functionality that optimizes green energy generation operations.

The Ovation SCADA system supports connections to various equipment used in alternative energy sites such as turbine controllers, mirror assemblies, substation controls, meteorological towers, and switchgear.

Our SCADA solution also supports multiple communication network types, such as dial-up, leased lines, and wireless. The Ovation SCADA system offers the capability to remotely start, stop, reset, and tag-out individual pieces of equipment, minimizing labor-intensive site visits.

Protective supervisory shutdown is automatically initiated by the Ovation SCADA system when certain predefined site conditions are reached. Diagnostic information derived from the generation equipment is available from the Ovation SCADA system through network interfaces. The SCADA system provides quick access to custom reports and allows you to easily track equipment maintenance schedules.

Ovation SCADA expands your control boundaries beyond the plant site by providing seamless connectivity to a host of other systems to enable informed business decisions. SCADA provides tools to transfer information between generating sites and corporate systems, improving your ability to meet dispatch and regulatory requirements, and manage your overall generation fleet.

A Total Solution Provider
Emerson is comprised of the most widely implemented instrumentation and control solutions, including brands like Rosemount®, Fisher®, Mobrey, Bristol ControlWave®, Ovation, Liebert, ASCO, U.S. Motors®, Control Techniques, and more. Realize the full potential of your plant automation by employing an Emerson total solution to achieve superior results.
**Project Management**
Successful project execution requires an experienced, global team of industry specialists, project managers, and lead engineers who know how to apply technologies designed specifically for the power generation industry.

Emerson’s power team consists of hundreds of highly skilled support personnel who are dedicated to designing and implementing innovative automation solutions. Made up of individuals with years of experience, our team includes custom application engineers, instrumentation technicians, SCADA experts, graphic designers, schedulers, program managers, integration specialists, and many others.

**Project Implementation**
Emerson implements industry-standard best practices to achieve success within the constraints of each project. Through conception, design, and implementation, highly experienced Emerson project managers work closely with you to provide high-quality engineering services during development of the specification, control strategy, and project standards.

Emerson can provide a total plant or fleet-wide solution that includes front-end engineering and design (FEED), equipment selection, and commissioning services.

**Service**
Behind every Emerson customer stands a dedicated team of service and support personnel to assure your solution delivers the utmost in performance and reliability. Emerson service experts know your systems, understand your business and can help you operate your plant safely, reliably, and more efficiently.

We offer an array of support modules through our comprehensive SureService™ customer support programs. These programs help you to maintain operations and enable you to leverage today’s digital technologies for predictive and preventative maintenance and operations.
Emerson offers the best control system migration plan in the industry by providing multiple solutions for upgrading to next-generation technology. Engineering and training requirements are minimized, keeping the cost of your upgrade project in-line with your budget.

**Training**

Emerson’s training mission is to deliver world class instructional programs that reflect what our customers require to be successful in the critical roles they play.

Whether it is a position in Instrumentation & Controls engineering, control room operations, project management, or plant operations, our focus is to ensure that there are training options that meet your every need.

Emerson instructors are equipped with decades of experience in all aspects of the power generation industry and are eager to help you realize your professional goals.

“The recent response of Emerson’s team was nothing short of exemplary. The support from headquarters along with your on-site service engineer was fantastic. Problems were not only quickly identified and fixed, but you took the time to fully explain everything to my personnel. Again, the response of the Emerson team was EXCELLENT!”

Mike Henrich
Plant Manager
North American Energy Services
New Covert Generating Company, LLC
Covert Generating Facility

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**Customers Agree — Control Magazine Reader’s Choice Awards**

<table>
<thead>
<tr>
<th>Year</th>
<th>Emerson</th>
<th>Rockwell</th>
<th>Honeywell/Invensys</th>
<th>Siemens</th>
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<td>2005</td>
<td>Emerson</td>
<td>Rockwell</td>
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**Emerson Remains First in Process Control/Automation Systems**

**Emerson – Ranked first in 49 pertinent product categories.**

<table>
<thead>
<tr>
<th>Company</th>
<th>Total 1st/2nd/3rd Place Finishes</th>
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<tbody>
<tr>
<td>Emerson</td>
<td>43</td>
</tr>
<tr>
<td>Rockwell</td>
<td>13</td>
</tr>
<tr>
<td>Siemens</td>
<td>9</td>
</tr>
<tr>
<td>Invensys</td>
<td>4</td>
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<td>ABB</td>
<td>4</td>
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**Emerson – First in Services**

<table>
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<tr>
<th>Rated “Very Good” or “Better”</th>
<th>4 times more than the nearest competitor</th>
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<td>Emerson</td>
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</table>
Why Emerson?

Unparalleled Industry Expertise
For over a century, Emerson has energized the power industry with new and revolutionary ideas. We understand the complexity of power generation operations, your unique application requirements, and your stringent performance criteria better than anyone else in the business. This knowledge is embedded in every Emerson renewable energy automation solution.

World-class Technology
Using the world’s most advanced technology, Emerson has been helping customers to control critical power generation processes for decades. Our superior technologies provide a comprehensive solution to help meet operational readiness objectives for either new-build or existing alternative energy challenges.

Collaborative Approach
Emerson’s power implementation team is not complete without the expertise and skill provided by your staff. We encourage your training, projects, and generation station personnel to be involved throughout the entire automation development process to provide effective results.

Long-term Support
Emerson has a long history of providing our customers with the highest level of support. Our commitment to long-term support for your renewable solution will help you achieve business objectives, reduce or contain operating and service costs, and keep your system running at peak performance today and well into the future.

Strength and Stability
When executing critical projects, you need to know that the partners you select are strong and stable, and will continue to be a solid corporate presence far into the future. Emerson has a long history of designing, implementing, and supporting automation technologies. We have an unparalleled portfolio of growth and success, even in years characterized by a lean business cycle. Our clear technology leadership and fiscally stable operations make Emerson the logical choice to design, engineer, and support your green energy automation project.

The Secure Choice for Protecting your Renewable Investment