Generate better performance.

Combined Cycle Power Generation
Leverage Emerson’s valves, actuators, regulators, and services to reduce operating costs and improve your plant flexibility, availability, and reliability.
How will you continue to meet your targets in the face of such dramatic change?

As a power producer, you’re facing dynamic times. You’re now cycling your plant more often to meet load balancing requirements, optimize fuel costs, and accommodate renewables on the grid. These operating conditions create increased thermal and mechanical stresses on your equipment and can push them to failure.

Yet to meet your commitments, you need to drive higher plant availability while being challenged to do more with constrained resources and a diminishing workforce.

Conditions are now more difficult than ever for you to achieve your generation and financial targets. But what if there was an expert partner you could turn to, that could help you navigate these challenging times?

**Focused productivity investments are needed to meet generation targets and control operating costs.**

- 60-80% of all power plant failures are related to cycling operations.  
  - “Make Your Plant Ready for Cycling Operations”  
  - Power Magazine, August, 2011

- A typical 400MW plant loses $1.175M each year due to unplanned outages.  
  - “Quantifying the Cost of Unplanned Outages”  
  - Energy-Tech, August, 2012

- In the US alone, 25% of electric utility workers will be ready to retire within 5 years.  
  - Transforming the Nation’s Electricity System  
  - QER Task Force, January, 2017
Meet load demands faster and more reliably with the help of a trusted expert

To remain competitive and meet both your generation and financial targets, you need to adapt. Emerson’s power industry experts can show you how optimizing final control solutions, such as control valves, critical isolation valves, pressure relief valves, regulators, actuators, steam traps, and instrumentation can reduce your operating costs and enhance plant generating efficiency.

**Optimize your plant for cycling operations**
- Improve the speed, quality, and accuracy of your fuel gas delivery system
- Design in flexibility to improve ramp rates and boost unit responsiveness
- Increase plant efficiency with precise measurement and control solutions

The Fisher™ fuel regulator provided responsive pressure control without a single unit trip for more than two years and required no maintenance.
– Results for one US Power Plant

**Improve plant availability while reducing operating costs**
- Implement solutions that perform longer in increased cycling conditions
- Minimize downtime with solutions that are engineered for rapid maintenance
- Monitor valve performance to predict and proactively address potential failures

Emerson’s Yarway™ Welbond repairable valve can reduce costs by 58% over 3 repair cycles.

**Harness the expertise and resources of a Main Valve Partner™**
- Leverage Emerson’s smart technologies to unburden your workforce
- Engineer efficiency into your plant with the help of Emerson’s power experts
- Reach new heights of performance with genuine OEM training and support

“Having a remote monitoring system means we don’t have to worry as much about valve failures.”
– Valve Technician, City of Ames Electric
Ames, Iowa, USA
Combined Cycle Power Solutions

Fuel Storage & Distribution
- Optimize control of fuel delivery ▶ p6
- Reliable isolation of fuel ▶ p6
- Tank blanketing and pressure management ▶ p6

Heat Recovery Steam Generator
- Extend equipment life with accurate drum level control ▶ p8
- Maintain precise steam temperature control ▶ p8
- Reliably drain and vent the system with zero leakage isolation ▶ p8
- Protect critical assets from overpressure ▶ p8

Steam Turbine
- Improve plant flexibility with reliable isolation of your steam turbine ▶ p10
- Ensure efficiency and longevity of your turbine with effective sealing and lubrication ▶ p10

Condensate System
- Protect pumps from overheating and prevent cavitation ▶ p12
- Handle extreme flow rates to maintain consistent deaerator level ▶ p12

Combustion Turbine
- Improve speed of response and accuracy of fuel control ▶ p6
- Condition fuel for optimal combustion performance ▶ p6

Emission Control
- Reliably store and control the flow of ammonia for SCR ▶ p12
- Reduce fugitive emissions with FE compliant solutions ▶ p12

Feedwater System
- Achieve smooth transition from startup to full load ▶ p12
- Protect your turbine from possible water induction ▶ p12

Balance of Plant
- Control the flow of water through your plant ▶ p12
- Control, isolate, protect, and regulate BoP processes ▶ p12
Combustion Turbine Solutions
Improve the operational flexibility of your combustion turbine to respond rapidly to load changes, allowing you to realize greater efficiency and equipment longevity. ► p5

Heat Recovery Steam Generator Solutions
Achieve optimal steam generation performance with solutions that increase thermal efficiency and deliver controlled, stable steam to the turbine while protecting your equipment and reducing tube leaks. ► p7

Steam Turbine Solutions
Increase the flexibility of your plant with the ability to reliably bypass your steam turbine during transient operations and allow your combustion turbine and heat recovery steam generator to operate independently. ► p9

Balance of Plant Solutions
Gain greater insight into inefficient Balance of Plant (BoP) systems and faulty plant components to take corrective action before your operations are impacted. ► p11
Combustion Turbine Solutions

Your combustion turbine is the key to your plant’s ability to drive profitable operation. How efficiently your turbine is able to respond to load change requirements is critical.

These variable conditions from baseload capacity, to cycling operations, to peaking support stress equipment and it is your turbine and surrounding equipment’s ability to perform reliably for extended periods that determines the success of your operations.

What’s your opportunity?

- Improve turbine flexibility with more responsive fuel control
- Increase combustion efficiency with higher quality fuel supply
- Reduce turbine trips with smooth pressure control
- Minimize product loss with zero leakage isolation

Operate your combustion turbine with confidence with expert support

Our combined cycle power generation experts work with you to optimize your combustion turbine performance. From safeguarding the purity of fuel during storage and distribution, through to fuel conditioning and control that provides optimal delivery to the combustion chamber.

Services offered...

- Digital valve monitoring and analysis
- Control valve calibration
- Regulator configuration and repair
- Tank blanketing system design
- Pressure relief valve configuration and repair
- Technology upgrades and retrofit
- Product and system training
Improve the efficiency of your combustion turbine with a fuel control solution that works seamlessly with supporting fuel and air control valves. These valves eliminate startup issues related to inaccurate level of the control valve and enhance a turbine-driven generator’s ability to respond to step changes.

Features:
- Quick response
- Proven, optimized, and customized designs
- Rotary, globe, and angle valves available
- Custom trim designs for extended life

Deliver reliable, stable fuel to your combustion turbine with dependable, smooth, and quiet operation in extreme service conditions.

Features:
- Rapid speed of response
- Absolutely no atmospheric bleed
- Excellent particle erosion resistance
- Minimized maintenance downtime

Suitable for use in fuel gas header, nitrogen filter, lubrication oil, and sealing system applications.

Features:
- Rapid speed of response
- Rugged construction for extended life
- Simple in-line maintenance

For more information, visit Emerson.com/FinalControl
Heat Recovery Steam Generator Solutions

With reliable final control solutions, you can run your Heat Recovery Steam Generator (HRSG) at optimal efficiency while managing steam output to the turbine with precise control.

Designed to operate with certainty in even the most challenging applications, you can rely on solutions from Emerson to help your HRSG perform in increased cycling operations, for longer.

What’s your opportunity?

- Accurately control drum levels
- Improve steam temperature control
- Enhance thermal efficiency
- Reduce heat loss with zero leakage drain and vent valves
- Protect critical assets with proven pressure relief valves

Don’t let your challenges boil over. Talk to an Emerson expert today.

Let one of Emerson’s final control experts help you optimize your HRSG performance. With extensive experience in the power industry, our experts can walk through your operations and take on any engineering challenge you need to solve.

Services offered...

- Digital valve monitoring and analysis
- Control valve calibration
- Desuperheater configuration
- Safety valve configuration and repair
- In-line drain and vent valve repair
- Parts management
- Product and system training
## Featured Heat Recovery Steam Generator Solutions

### Fisher | Sempell™ Spraywater Control Valves

Accurately control the amount of water injected into the steam attemperator, providing optimal main steam temperature control and stability.

Features:
- High rangeability for excellent system control
- Advanced sealing technology
- Anti-cavitation trim reduces noise and vibration
- Quick change trim

### Fisher | Yarway™ Attemperators

Variable geometry spray ensures rapid vaporization of spray water to provide optimal steam temperature and stability. Suitable for exposure to high thermal cycling, high steam velocities, and flow induced vibration.

Features:
- Ring or insertion style design
- Integrated design minimizes pipework

### Fisher | Sempell Drum Level Control Valves

Deliver precise and responsive control of water levels in your HP/IP drums, improving boiler efficiency and protecting associated equipment.

Features:
- Trim design reduces damaging cavitation
- High rangeability provides smooth transition from startup to full operation
- Advanced sealing provides tight shutoff

### Anderson Greenwood™ | Crosby™ Pressure and Safety Relief Valves

High capacity, high pressure valves excel in drum, superheater, reheater, and economizer applications to limit product loss and improve unit efficiency.

Features:
- Spring and pilot operated
- Small opening and closing differential
- Fewer parts and fast, simple adjustment

### Sempell Main Steam Isolation Valves

Gate, globe, and check valves for main steam isolation provide reliable, repeatable shutoff in high pressure, high temperature conditions.

Features:
- High rangeability for excellent system control
- Advanced sealing technology
- Anti-cavitation trim reduces noise and vibration

### Sempell | Yarway | Fisher Drain and Vent Valves

Rugged, low maintenance isolation valves efficiently facilitate the removal of liquid from steam lines while providing tight shutoff to minimize product loss.

Features:
- Robust, severe service design
- Rapid maintenance
- Simple automation

### Yarway Boiler Trim Valves

Blow-off and throttling valves designed for continuous blowdown. These valves provide reliable and longer lasting service in high velocity and erosive applications.

Features:
- Robust construction
- Efficient operation
- Rapid in-line repair

### Yarway | Penberthy™ Liquid Level Indication

Mechanical and electronic level gauges provide cost-effective water sensing.

### Additional products
- Electric, pneumatic, and hydraulic actuators
- Sky vent valves
- Steam traps
Steam Turbine Solutions

Steam turbines represent one of the most substantial investments for a power plant, but as they age, more precise and reliable control technology is critical to maintain performance. Emerson’s final control products and services help ensure the continued reliability, responsiveness, efficiency, and protection of these critical plant assets.

What’s your opportunity?

- Reliably isolate the turbine during startup, shutdown, and plant upset conditions
- Precisely control bypass steam temperature
- Reduce heat loss with zero leakage isolation
- Protect your turbine from overpressure

Operate your steam turbine with confidence

Improper control, monitoring, and protection of your turbine could prove catastrophic to your operations. Talk to an Emerson expert about the final control products and services that will help ensure your turbine runs efficiently with ultimate reliability.

Services offered...

- Digital valve monitoring and analysis
- Control valve calibration
- Desuperheater configuration
- Safety valve configuration and repair
- In-line isolation valve maintenance
- Emergency technical and onsite support
- Product and system training
Featured Steam Turbine Solutions

Fisher | Sempell Complete Turbine Bypass Solutions
Improve your plant flexibility by reliably isolating your steam turbines during startup, shutdown, and plant upset conditions allowing the combustion turbine and steam generator to run independently.

Emerson offers a complete and integrated turbine bypass solution designed to isolate the turbine, whilst controlling and reducing up to full load main steam pressure and temperature.

Emerson’s integrated solution is engineered to withstand high pressure drops, reduce the harmful effects of noise and vibration, and withstand the impacts of frequent cycling.

Vanessa Turbine Trip and Throttle Valves
Safely and reliably perform steam turbine trip and throttle functions with a fully engineered solution that provides both zero leakage shutoff and modulating service.

Features:
- High speed closing
- SIL3 capability
- Compact valve and actuation
- Long service life with low maintenance

Sempell | Fasani Turbine Steam Extraction Valves
Gate, globe, and check valves designed in conjunction with major turbine OEMs to provide reliable shutoff in critical turbine applications.

Features:
- Low pressure drop
- Designed for cycling duty
- Outstanding hard facing process
- High speed closing

Sempell | Vanessa Reheat Isolation Solutions
Reliably isolate the reheater unit with proven solutions including reheat balancing valves, non-return valves, and reheater isolation valves. Features:
- Extended service life
- Reduced maintenance
- Designed for cycling duty
- Outstanding hard facing process

Fisher Drain Control Valves
Perform quick acting and effective drainage of the turbine during startup and preheating of the turbine body.

Features:
- Available in carbon, stainless, and alloy steel
- Compatible with DIN and ASME standards
- Low noise trims
- Single or multi stage pressure reduction

Sempell | Fasani Turbine Steam Extraction Valves
Provide highly reliable pressure control of turbine lubrication and sealing systems that improve turbine efficiency, protect critical components, and extend service life.

Additional products
- Electric, pneumatic, and hydraulic actuators
- Gate, globe, and check valves
- Drain valves, vent valves, and steam traps
- Steam extraction and induction valves

For more information, visit Emerson.com/FinalControl
Balance of Plant Solutions

Maintaining your plant while ensuring it operates at peak efficiency requires attending to more than your heat recovery steam generators and turbines.

Emerson’s valves, actuators, regulators, and instrumentation can improve the efficiency and safety of your Balance of Plant processes, helping you reduce forced outages and derates as well as improve overall plant heat rate.

What’s your opportunity?

• Efficiently manage fuel supply and storage
• Meet regulations with reliable emission control
• Optimize water intake, treatment, and circulation
• Maximize turbine output with more reliable condenser cooling

Capture efficiency gains by selectively upgrading your Balance of Plant assets

If you’re looking for performance improvements in your Balance of Plant processes, get in touch with an Emerson expert who can review your operations and suggest enhancements that will most cost effectively increase process efficiencies.

Services offered...

• Digital valve monitoring and analysis
• Control valve calibration
• Desuperheater setting
• Safety valve configuration and repair
• In-line isolation valve maintenance
• Product and system training
• Startup, shutdown, turnaround, and outage support
## Featured Balance of Plant Solutions

### Fisher | Sempell
**Boiler Feedpump Recirculation**

Ensuring adequate flow is passing through the pump at all times. These valves are engineered to handle extreme cavitation caused by high temperature and pressure drops.

**Features:**
- Advanced sealing technology
- High turndown handles extreme flow rates
- Trim design reduces noise and vibration

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### Fisher | Sempell
**Condensate Pump Recirculation**

Prevent overheating and cavitation by providing the recommended minimum flow of condensate through the pump while withstanding varying outlet conditions.

**Features:**
- Advanced sealing technology
- High turndown handles extreme flow rates
- Trim design reduces noise and vibration

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### Fisher
**Deaerator Level Control Valves**

Maintain consistent deaerator level while handling extreme flow rates and minimizing the effects of cavitation.

**Features:**
- Advanced sealing technology
- High turndown handles extreme flow rates
- Trim design reduces noise and vibration

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### Anderson Greenwood | Crosby
**Pressure Relief Valves**

Protect your Balance of Plant pressure vessels against overpressure events while minimizing product loss with high performance spring and pilot operated pressure relief valves.

**Features:**
- Highly customizable to exact specifications
- Fast installation, adjustment, & replacement
- Full compliance with major global standards

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### Bettis™ | EIM™
**Electric & Pneumatic Actuators**

Designed for the harsh environments of power generation, these actuators provide reliable actuation in high heat, high thrust, and more frequent cycling.

**Features:**
- Higher operating efficiency
- Superior position accuracy
- Robust, low maintenance, long life designs

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### Keystone
**Cooling Water Isolation Valves**

Ensure the reliable delivery of water throughout your plant from intake to treatment through to cooling and recirculation.

**Features:**
- Zero leakage isolation
- Superior materials for corrosion resistance
- Lower operating torques requiring smaller actuation and reduced energy consumption

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### Fisher | Sempell | Fasani
**BoP Isolation Valves**

Reliable, repeatable shutoff suitable for all of your Balance of Plant isolation applications.

**Features:**
- Robust design
- Rapid maintenance
- Simple automation

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### Yarway ARC®
**Pump Protection Valves**

Protect your centrifugal pumps against thermal damage and destruction with reliable, self-contained, and low maintenance automatic recirculation control valves.

**Additional products**
- Liquid level gauges
- Instruments and controllers
- Fire and air utility system regulators
- 3-way feedwater heater bypass valves

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For more information, visit Emerson.com/FinalControl
Continuous support in the face of changing market and operating conditions

Emerson leads the way with industry-defining end-to-end digital service experiences, helping you achieve superior outcomes through our maintenance, reliability, and performance offerings. The tools we’ve developed support the digital transformation of the power industry, providing the confidence to extract the maximum value from your service and technology investments. Our teams partner with you across the globe to help you maintain safe operation, improve reliability, and optimize plant performance.

With over 100 regional service centers and 60+ mobile service centers worldwide, local experts are available to work with you to understand your unique challenges and help you find a solution. Our broad portfolio of service offerings allows us to tailor our support to align with your specific business goals.

**Connected Services**
Leverage smart valve technology and Emerson expertise to help your workforce make informed performance and reliability decisions at speed.

**Outage Services**
Identify, prioritize, and plan long term plant reliability improvements to reduce maintenance events and improve generation performance.

**Education and Training**
Train new hires, improve your current workforce skills, and help your team adapt to new technology or products.

**Startup and Commissioning**
Certified technicians meticulously work through approvals, calibration, testing, and certification to deliver a comprehensive handover, on time and on budget.
With locations worldwide, Emerson local experts are never far away. Get in touch today to arrange a site walk and see the value Emerson can bring to your operations.
Improve your plant availability, flexibility, and reliability.

Emerson delivers time-tested and innovative power generation solutions designed to help you address the reliability, flexibility, compliance, and resource scarcity of your operations. Contact us for world-class technologies and services that can maximize your efficiency and profitability, and meet the industry’s most rigorous standards. Getting started is easy. Visit: Emerson.com/FinalControl