POWER INDUSTRY

invensys™

COMPREHENSIVE SOLUTIONS FOR POWER GENERATION AND TRANSMISSION & DISTRIBUTION





OPERATIONAL EXCELLENCE

Choose the leader
Invensys is a world leader in power industry automation, providing a full range of control products, applications, and services to satisfy growing electrical demand worldwide – in an increasingly competitive market. Our operational excellence approach brings you superior technology, reliable and accurate industrial-grade instrumentation, and enterprise-wide, real-time control and information solutions.

ENTERPRISE CONTROL

The world's first Enterprise Control System
The InFusion ECS is the world's first Enterprise Control System – allowing the use of all of today's leading process automation and information systems together, regardless of supplier or generation, as one unified business environment. InFusion brings the concept of process control to business operations. Furthermore, InFusion fosters a collaborative environment by making the plant visible to the enterprise and the enterprise visible to the plant, dramatically increasing plant and business operational agility. By facilitating the transformation of data to information to action, InFusion accelerates decision-making while enhancing the ability to detect and respond to problems.

Because InFusion is the Enterprise Control System from Invensys, it encompasses all of the products offered by Invensys. InFusion gives Invensys customers best of breed capabilities in an open, flexible system with capabilities beyond other vendors. We're bringing more than any single product or discipline – we're bringing consulting, services, and a proven portfolio of specialized offerings from our well-known legacy brands of Wonderware, Foxboro, Triconex, Skelta, SimSci-Esscor, Eurotherm and Avantis.



MEETING THE CHALLENGES

Invensys is helping the Power Industry meet the challenges of the 21st century

- **Growth** – the increase in demand created by emerging countries and the replacement of existing power plants
- **Aging** – the need to modernize obsolete control & safety systems, and capture the knowledge of an aging workforce
- **Sustainability** – reduce energy usage/carbon emissions, and improve plant safety and reliability
- **Cost** – minimize maintenance costs, optimize production and operating costs, achieve greater productivity and efficiency
- **Adjust load to demand** – economically balance changing demand with the volatility in fuel costs

Invensys Solutions

- Integrate Instrumentation on Control & Safety Systems for Coal-Fired Power Plants, Combined Cycle Gas Turbines, and Nuclear & Renewables
- Rapidly upgrade or migrate existing systems, minimizing disruption to control and protecting Turbo-Machinery
- Manage the system lifecycle
- Make coal cleaner by using advanced generation technology (IGCC – Integrated Gasification & Combined Cycle, Oxyfiring, Supercritical or Ultra-Supercritical technologies)
- Increase overall plant efficiency with Advanced Process Control for optimizing boiler combustion
- Coordinate boiler and turbine operation
- Reduce and control emissions
- Manage the fleet of power generation stations
- Increase operator effectiveness with advanced solutions such as Operator Training Simulation and Alarm Management
- Provide Enterprise Asset Management

MORE REASONS TO CHOOSE INVENSYS

- Independent from any power plant OEM
- Generic platform for use across all industries
- Best ramp rates possible with patented Performance Plus Coordinated Control™
- Use actual boiler and auxiliary equipment performance to calculate maximum instantaneous allowable ramp rate
- Operate at maximum limits of mechanical equipment for any given condition
- Utilize an embedded expert system to select best response to major upsets, including mode, ramp rate and target
- Eliminate need for operator intervention to prevent a boiler trip
- Dynamically adjust ramp rate relative to proximity to target in order to prevent overshoot
- Protect equipment from life cycle consumption due to overshoot
- Fastest trip investigations with 10 msec resolution of analog points
- System wide 1ms SOE
- GPS synchronization
- Lowest risk for project schedule and quality with the best and most experienced engineers in the business

Differentiators – our know-how

- Enables faster project delivery
- Provides the best possible ramp rates
- Prevents trips without operator intervention – reduces cyclic life expenditure
- Speeds return to service with the industry's best analysis tools
- Provides engineering tools that reduce project risk and assure a quality project
- Utilizes the industry's most reliable DCS to improve availability
- Extends the life of any control system

Value Drivers addressed

- Reduce cost to produce
- Improve unit availability and capability
- Capital investment protection
- Lowest maintenance/operational cost
- Reliable – low risk implementation
- Continued operational improvement

Experience

- A performance leader in the power industry for more than 100 years
- Over 1700 power generation units under control, enabling 20% of the worldwide generation capacity
- Demonstrated heat rate, ramp rate and reliability improvement
- Internationally recognized power control expertise
- Experience ranging from automation, to asset intelligence, to power processes and real-time business management that helps clients drive bottom line results from their production assets and talent base



FOSSIL POWER GENERATION

The best application solutions available for fossil power generation
The electrical power generation industry is demanding much more of its control and instrumentation suppliers – and Invensys is delivering. Our application successes include retrofits, grassroots plants, drum and once-through boilers, large reheat steam turbines, combustion turbines, integrated burner management, environmental control and monitoring, plantwide real-time data acquisition, network information integration, measurement integration of intelligent field devices and more. Our well-staffed, experienced, dedicated power engineering organization ensures customer satisfaction for power projects worldwide.

Get benefits that improve your operation – and your competitiveness

- Faster load-following capability through adaptive, nonlinear, multivariable coordinated control
- Extended on-line availability resulting from our inherent hardware reliability, software quality, and system security
- Improved heat rate through advanced control and optimization techniques (adaptive tuning, constraint control, neural networks, expert systems)
- Increased unit operational range via more accurate multi-output loop compensation strategies
- More stable operation resulting from an integrated plantwide control system, consistent and intuitive displays, and tighter setpoint controls
- Faster and more reliable startups, with on-screen operator guides and automatic equipment startup

COMBUSTION TURBINE SOLUTIONS

For simple or combined cycle turbines



Combustion turbines come in a variety of configurations and operating modes, ranging from simple cycle combustion turbines to combined cycle combustion turbines with fired or unfired heat recovery steam generators and steam turbines. This wide choice provides numerous economic advantages, but complicates operation. You must integrate several control subsystems to achieve the best overall performance. To ensure successful, secure, error-free operation, integrate all of your subsystems into the InFusion ECS system. You get a common, well-planned operator interface – and a unified plant control strategy.

Go with the most knowledgeable, experienced partner. Invensys has more experience controlling and monitoring combustion turbines than any other control system manufacturer. Every project we implement has the complete support of our extensive worldwide services. And every project can take advantage of the InFusion ECS.

- Comprehensive real-time performance information, using standard performance calculation packages applied for your plant
- Reduced field wiring installation and startup delay costs by remotely locating environmentally hardened I/O modules
- Improved unit availability with a fault-tolerant, "no single point of failure" configuration
- Enhanced load management of power generation at each station and load distribution between combustion turbine, HRSGs, and steam turbine
- Faster controlled startups through "single button" automatic startup/shutdown option

NUCLEAR POWER PLANT SOLUTIONS

Plant protection and control



Our long experience in providing intelligent automation instruments and systems for nuclear power plants worldwide makes us a natural choice for your nuclear application. Invensys industry "firsts" include the first operational digital safety system replacement and the first digital feedwater control system in the U.S. These days, our experts participate vigorously in setting nuclear standards on a number of IEEE, ISA, and EPRI committees. And nowhere is our industry leadership more strongly demonstrated than in the 50,000 nuclear-certified modules supplied to 120 nuclear power units around the world. When you need products and services with proven, intelligent design, come to Invensys.

- High-availability digital systems for safety system upgrades that are proven, licensed, simple, and secure
- Protection against common mode failure: quality systems and diverse equipment
- Incomparable security in the world's first open industrial system – fault-tolerant, cost-effective performance
- A world-class, dedicated nuclear support organization – competitive, experienced, and responsive

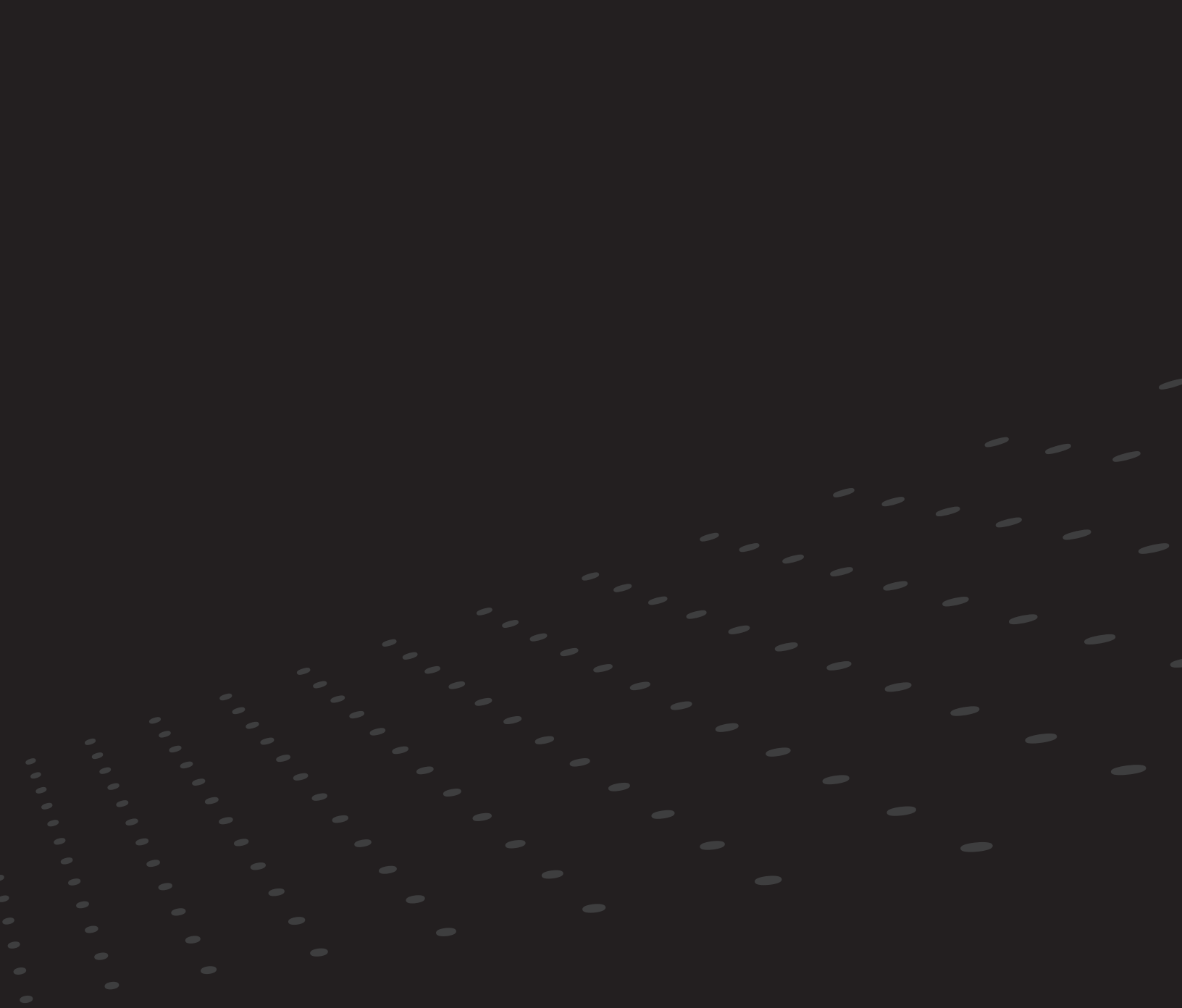


COMPREHENSIVE ECS, EMS, DMS AND SCADA SOLUTIONS

Transmission and distribution
Electrical distribution centers everywhere are installing much-needed expanded distribution capability. Their aim is to meet high-demand growth in developing regions, restructure for deregulated supply environments, provide for flexible wheeling of power through interconnected networks, and manage delivery systems to defer generation investment. To accomplish all this, progressive utilities are taking advantage of intelligent devices to help integrate control networks into sophisticated new systems. They know these systems can provide more advanced and cost-effective strategies – both within the substation and across the power network. That's why power engineers all over the world are choosing InFusion SCADA systems.

Invensys offers comprehensive power transmission and distribution solutions, starting with field interfaces and substation automation controls, and continuing up to high-level power applications for ECS, EMS (Energy Management System) and DMS (Distribution Management System) systems running on "open" SCADA networks, spanning multiple centers.

- Automatic generation control
- Generation dispatching and interchange scheduling
- Unit scheduling; network and security analysis
- Distribution network management
- Integration of GIS and TCM systems
- Substation automation
- Communications network integration
- Turnkey dispatch system responsibility
- Software system integration
- Smart grid



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