



Nexus OnCore[†] Control System and Nexus OnCore[†] Compact Control System

Steam turbine control systems that increase your competitive advantage

Overview

In today's competitive production environment, process industries demand control systems that increase productivity, reliability and quality while lowering cost. Nexus Controls offers a family of advanced, fully configurable control system solutions that improve overall unit reliability and availability, provide simplified expansion capabilities and reduce overall installation and training costs.

Designed and built using over 150 years of industry-proven control system expertise, the Nexus **OnCore** Control System and the much smaller Nexus **OnCore** Compact Control System provide seamless integration of advanced control and optimization solutions to further improve communication speed and reliability, reduce forced and unplanned outages, extend maintenance cycle, and decrease operation costs.

Benefits

- Logic configuration is completed online to avoid excess system outage or shutdown.
- The redundant system architecture provides enhanced control reliability and uninterrupted system access.
- Redundant I/O communication and power enables independent replacement of modules without a complete system shutdown.
- Three-level system network provides real-time performance with high-speed data exchange where needed the most—between the controller and HMI. Non-critical information, such as data backups, is handled on a separate data highway.
- Integrated Nexus **OnCore[†]** OptimumC HMI software package includes embedded historian and engineering tools. Historian can be expanded without additional equipment, saving cost and allowing for more analytical capability.
- Easily configured software allows for customization of HMI screens, reducing training time while improving the user experience.
- Consistent turbine control approach, independent of manufacturer.

System hardware

Controllers

Central to the Nexus **OnCore** Control System solution is the iDPU controller. The iDPU is an integrated, stand-alone computer that runs the application code for industrial process control and data communication. It interfaces with process I/O modules and can be implemented in either a simplex or redundant configuration, depending on user requirements.

The control software supports powerful control applications through straightforward configuration of function blocks. A wide range of process control capabilities include:

- Data Acquisition
- Continuous Control
- Logic Control

Both on-line and off-line configuration is supported.



A comparison of the rack-mounted Nexus **OnCore** Compact Control System (on the left) and the traditional, full-sized Nexus **OnCore** Control System (on the right)

Speed measurement and protection module

The Nexus **OnCore** Control System product family has a dedicated speed measurement and overspeed protection module (MSP) for use in steam turbine control, compressor control, hydro turbine, and other large rotary machine speed detection and protection applications. This module can be configured as Triple Module Redundant (TMR) mode which provides high-reliability and availability. The embedded overspeed control logic inside the MSP module enables fast response to emergency situations even if the controller (iDPU) fails. In addition to the MSP module, an MLP module, with two out of three relay voting, is provided for turbine emergency protection. Embedded Sequence of Event (SOE) also helps to identify the root cause of a trip with 1 ms resolution.

Valve position control module

This dedicated valve positioning module with on-board PID servo control can be used in steam or hydro turbine control, boiler bypass valve control, and other servo valve control applications. Valve Position control module provides fast close-loop for servo control with smart selection of redundant LVDTs. With the use of the software tool included in an engineering work station, the user can easily calibrate the position feedback (LVDT). Module configurations can be saved off-line without the need for re-tuning in the unlikely event a module needs replacement.

Operator station and HMI

Each operator station supports control, monitoring, and configuration of the entire system. This allows a uniform graphical interface for all plant operations. Features of the operator station and Nexus **OnCore** OptimumC HMI software include:

- Administrative control of user access levels
- Single-point display for monitoring and control.
- Flexible alarm-monitoring capability (available in alarm list or embedded in operator graphics).
- Real-time and historical trend reports; both time-based and event-based options.
- Configurable and redundant system historical data collection and storage.
- Fault detection-based historical data and SOE event records allow operators to pinpoint cause and determine response.

A library of standard display elements is supplied with the option of creating custom-built dynamic displays based on user standards and requirements.

Control System suite options

The Nexus **OnCore** Control System product family provides a suite of integrated control solutions to customize your system for your site's needs. Some options include:

- Boiler Control System (BCS)
- Load Demand Control (LDC)
- Burner Management System (BMS)
- Steam Turbine Control System (TCS)
- Balance of Plant (BOP)
- Selective Catalytic Reduction (SCR)
- Flue Gas Desulfurization Scrubber Control (FGD)

System architecture

The Nexus **OnCore** Control System product family has been engineered with special attention to diagnostic and redundancy features. Its distributed architecture reduces impact from loss of system components and provides production continuity. The component and network redundancy guarantees the operability of critical system and control functions.

Control, I/O, operator stations, engineer stations, data management, and gateway functions are distributed on real-time networks to provide system integrity and timely data transmission. Each node in the system is autonomous yet closely integrates with its peers. This architecture distributes risk so the loss of any one component does not affect the rest of the system. It also allows for optimization of available space by distributing control, I/O and HMI functions to different areas of a plant, eliminating the need to allocate a large, central area for installation.

System software

The Nexus **OnCore** Control System product family provides an integrated, easy to use and configure comprehensive software package for plant operations. The software allows for integration of displays, logs, graphics and alarms to give operators a comprehensive view of the plant and its assets. This provides a clearer picture for data analytics and troubleshooting. The Nexus **OnCore** OptimumC HMI software is intuitive and contains open source logic that users can configure to adjust to plant needs.

Mechanical solutions

Nexus Controls electromechanical solutions are a critical piece of a control system migration or full panel retrofit. Integration considerations need to be made based on the age of the control system and the interface with the software and electromechanical components. Nexus Controls has the expertise and OEM knowledge to evaluate these needs to ensure assets remain reliable. Our solutions have the potential to improve performance, online capability, provide redundancy and fit within the current operations envelope.

Critical components that need to be evaluated include transducers and transmitters, fuel valves and fuel skids, and speed sensing. Nexus Controls also provides solutions for Trip Manifold Assemblies (TMAs), Hydraulic Power Units (HPUs), and other assets that are important to operations. Our 150 years of experience includes steam, hydro, and gas turbines as well as balance of plant. We have the application knowledge to make sure that your assets are upgraded correctly.

Typical Nexus OnCore Control System Cabinet (Front Side)



About Nexus Controls

Nexus Controls LLC (formerly GE Energy Controls Solutions) exists as the collective experience and history of multiple companies whose expertise, knowledge, and lineage spans over 150 years.

Our global team of domain experts are in 44 countries on all six continents and have successfully delivered over 11,000 successful projects in the power, oil & gas, and various industrial markets.

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Generator Control Options

As part of a complete turbine-island control solution, the Nexus **OnCore** Control System can be delivered with an integrated Automatic Voltage Regulator (AVR), providing modern generator control and protection functions across a wide variety of AVR applications and generator OEMs from a global leader in excitation retrofits. Nexus Controls can help to select the right AVR platform and features to support the unique performance and budgetary requirements associated with upgrading critical generating assets. Whether operating in an industrial setting or as a baseload utility unit, up-to-date generator controls can improve voltage stability, system protection and include the latest power system stabilizer software to serve critical loads and maximize revenue service. The new controls are delivered with a focus on cybersecurity and contemporary system models to support evolving operating threats and regulatory compliance requirements.

The Nexus Controls' team can deliver pre-engineered AVR modernization solutions as one coordinated project, implemented by a team of turbine-generator control design, installation, and commissioning specialists. The upgrade package is available as an integrated unit control and AVR in a single cabinet, or with the AVR in a free-standing cabinet, or as panel inserts for installation in existing AVR cabinets or generator control panels (GCPs), all with an emphasis on flexible, cost effective upgrade options. Controls retrofit projects are delivered with a comprehensive documentation package to support maintenance, trouble-shooting and long-term support.

Innovative hardware and software packaging delivers an efficient system formfactor, optimized project work-scope and a unified operational experience through the Nexus **OnCore** Control System OptimumC HMI. The Nexus **OnCore** OptimumC HMI becomes the window into AVR management, consolidating operating controls, system status and time stamped alarm windows into our intuitive software interface.

For projects requiring a custom AVR solution or turn-key static excitation (up to 8,000Adc), the Nexus Controls' team can develop those options as well, supported by our in-house, multi-discipline, design engineering team.