**Nexus Controls**
a Baker Hughes business

# Nexus OnCore™ Control system

## A control system to increase your competitive advantage

### Overview

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

In today's competitive production environment, process industries demand control systems that increase productivity, reliability and quality while lowering cost. The Nexus **OnCore** Control System is an advanced, fully configurable solution that improves overall unit reliability and availability, provides simplified expansion capabilities and reduces overall installation and training costs.

Designed and built using industry-proven control system expertise, The Nexus **OnCore** Control System provides 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.
- 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 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.
- Remote I/O provides the unique ability of operating at a broad temperature range without loss of performance.
- The redundant architecture provides enhanced control reliability and uninterrupted system access.
- The rich function block library allows the user to customize the application and/or specific user defined sequencing, allowing for adaptability of plant configurations, both current and future.

### System hardware

#### Controllers

Central to the Nexus **OnCore** Control System 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.

**I/O Module**

The Nexus **OnCore** Control System I/O modules are highly reliable and easy to maintain. The needs of most applications can be met using general I/O modules (AI, AO, DI, DO, TC/RTD) with simplified I/O design and reduced spare parts. The I/O subsystem can accommodate any size application making it easily expandable and able to support local, remote, indoor, and outdoor installations (-20°C – 70°C). The Nexus **OnCore** Control System I/O modules include full-level, self-diagnostic functionality with local indication and connection to the iDPU controller. This feature provides feedback to the controller to verify that communication to the I/O modules is live and active, and helps with troubleshooting in the event of a loss of communication with the result of an "inquiry-response" compliant system.

**Speed measurement and protection module**

The Nexus **OnCore** Control System 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 HMI 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 application options**

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

- Power Management System (PMS)
- Process Control System (PCS)
- 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 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 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** Control System software is intuitive and contains open source logic that users can configure to adjust to plant needs.

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