Grid Solutions

OIL & GAS INDUSTRY SOLUTIONS

The oil and gas industry is evolving at a rate never seen before, facing volatile price levels, ever-changing regulatory requirements, and increased environmental consciousness. As the industry adapts, there is a growing need for reliable and innovative solutions that can help oil & gas operators achieve maximum potential of their primary and secondary assets, reduce costs and meet regulatory requirements for grid compliance and cybersecurity.

At GE Vernova, our full range of innovative products and service offerings for upstream, midstream, and downstream industry segments helps enhance process uptime, while lowering costs to maximize per barrel profitability.

Challenges

- **Unplanned Outages:** Product reliability issues and sudden loss of on-site generation can result in large downtime costs and loss of critical processes & production, impacting revenue.
- **Aging Infrastructure:** Outdated equipment and designs can increase the risk of equipment failures and breakdowns, compromising personnel safety & operational reliability.
- **Asset Performance:** Oil & gas operators often manage three times more secondary devices than primary assets. Lacking visibility on assets to identify and address performance issues promptly can lead to higher operational costs.
- **Cybersecurity Compliance:** Ensuring compliance with evolving cybersecurity standards requires substantial investment in advanced solutions, as well as continuous monitoring and updates to protect against emerging threats and safeguard critical infrastructure.
- **Electricity Costs:** Economical and/or grid compliance can require a facility to shed loads. Participating in demand response scenarios or peak shaving can greatly affect the financial impact of plant operations.
- **Energy Transition:** Ambitious sustainability goals often require oil & gas owners and operators to electrify their processes while reducing their carbon footprint.

GE Vernova Solutions

GE Vernova solutions enhance the availability and reliability of the critical assets of oil & gas operators while electrifying and decarbonizing their operations. Our solutions accelerate the energy transition with innovative, integrated and vendor-agnostic solutions for monitoring, protection, control, and secure communications.

Key Benefits

- **Minimize Unplanned Outages:** GE Vernova's Asset Management Solutions help oil & gas operators get increased visibility, control & monitoring of their primary and secondary assets, reducing unplanned downtime and O&M costs for increased profitability.
- **Reduce Downtime Costs:** Our solutions, such as fast load shedding can operate in less than 15ms, preserving critical loads for greater reliability. You can also improve the dispatch of on-site distributed energy resources for market participation and grid compliance.
- **Lower Emissions for a Greener Environment:** Achieve easy monitoring and management of the site's energy consumption using GE Vernova's Energy Efficiency Software, while reducing GHG emissions and achieving decarbonization goals.
- **Upgrade Infrastructure for Efficiency:** Using the latest electronic devices, operators can meet cybersecurity requirements, lower power consumption and increase reliability.

GE VERNOVA

Solutions & Services

- Energy Asset Performance Management (EnergyAPM)
- Motor Health Management
- Device Management
- Microgrid and Industrial Power Management
- Distributed Energy Resource (DER) Integration
- Fast & secondary Load Shedding
- Electrical Control System (ECS) Software
- Energy Efficiency Software
- Protection and control – Metering, Protective Digital Relays, Digital Substations
- Industrial Communication – Wireless, Hardened Optical Networks
- Networking Solutions
- Cybersecurity Solutions
- Engineering and Consulting Services

Outcomes

- Energy Savings
- Reliability
- Improved Asset Performance
- Sustainability
- Decarbonization
- Improved Power Quality

Value Drivers

- End-to-End Solutions
- Vendor-Agnostic
- Scalable & Flexible (from 10 to over 1 million assets)
- Highly Configurable

GE Vernova: Oil & Gas Industry Solutions

We offer a suite of innovative, end-to-end solutions to help oil & gas owners & operators unlock financial savings while increasing operational excellence.

Our solutions are flexible, scalable, vendor-agnostic, and configurable to support specific needs. From a first equipment pilot to a full end-to-end solution, or anywhere in between, we can help bring your oil & gas facility into a new era of opportunity. Powered by AI and Big Data, our solutions offer reliable monitoring, diagnostics, and data visualization, seamlessly integrating with existing IT systems and scaling from 10 to over 1 million assets.

Our broad experience lets us better understand your needs as we develop a path to achieve desired outcomes. We bring a complete range of technologies and industry knowledge together to enable cleaner, safer, more competitive, and more efficient operations for your facility.

PRODUCTS & SOLUTIONS	
Asset Management	With solutions such as GridBeats™ EnergyAPM, Motor Health Management and GridBeats™ Device Management, oil & gas operators can get increased visibility, control & monitoring of secondary and primary assets, and achieve reduced unplanned downtime and O&M costs for the facility.
Advanced Automation Applications	Increase revenue with enhanced control & dispatch of on-site assets and loads, through ancillary services and grid code compliance. • Reduce unplanned downtime and preserve critical loads with industry-leading solutions such as fast shedding and secondary load shedding.
Sustainability	Our Energy Efficiency Software (EES) solution revolutionizes the management and efficiency of energy consumption while effectively curbing GHG emissions, propelling organizations towards a more decarbonized future.
Protection, Control & Monitoring	Reduce CAPEX & deployment time, and improve reliability with GE Vernova's digital relays, feeder and motor protection, digital substation, and metering products. With over 100 digital substation projects in 27 countries, GE Vernova's expertise helps industries future-proof their electrical grids and improve asset utilization.
Industrial Communications	GE Vernova offers a wide range of solutions, including wireless routers and modems, optical edge technologies, cellular routers and gateways, TDM & packet transport, and high-density ethernet switches and converters to ensure reliable, secure communication between devices, and increased process uptime.
Cybersecurity, Engineering & Consulting Services	Protect your critical industrial assets and systems from the increasing threat of cyberattacks using GE Vernova's cybersecurity solutions to increase operational integrity. We also offer cutting-edge technical consulting services to assist with power protection, substation automation, and monitoring and diagnostics challenges.

Asset Management Solutions

Innovative, AI-powered Asset Management Solutions to increase asset visibility, performance, reliability, and business profitability.

GE Vernova's GridBeats™ Energy Asset Performance Management (EnergyAPM) solution gives complete visibility into asset health with predictive and prescriptive failure detection, enabling smarter, more efficient maintenance strategies. Built with a unique and safe microservices architecture, EnergyAPM can be customized to different application needs, from daily operation to strategic planning, ranging from 10 to 1M+ assets. Functionalities, processing power, and storage can be tailored to evolving needs at any time. The solution can be installed on premises or delivered as a cloud-managed service through various contractual set-ups including multi-year agreements and outcome-based contracts.

Motor Health Management services leverage the latest in condition-based asset health monitoring to deliver high-accuracy monitoring of critical motors. GE Vernova's advanced health algorithms, based on Electrical Signature Analysis (ESA) and Machine Learning provide early detection of electrical, mechanical, or thermal abnormalities before they become critical failures that bring plant processes to an unexpected halt.

Oil & gas operators often manage 3x more secondary devices than primary assets. GE Vernova's GridBeats™ Device Management solution implifies lifecycle management for your intelligent electronic devices (IEDs), ensuring security and resilience and avoiding human errors while streamlining operations.

BUILDING YOUR ENERGYAPM

CHOOSE FROM A SUITE OF INDEPENDENT MICROSERVICES & MICROAPPLICATIONS

Health
Improve asset life and value

- Single asset health
- Fleet health
- Zonal health
- Grouped asset type health
- Network health

Reliability
Based on assets' failure modes

- Detects impending failures
- Provides warnings & urgency
- Reliability analysis
- Asset criticality management

Strategy
Focus on target outcomes

- Lifecycle cost analysis
- O&M planning
- Simulate, improve & compare project costs and risks
- Return-on-investment analysis

Work
Prevent failures & enhance field work

- Recommendations
- Work requests
- EnergyFIT backoffice
- EnergyFIT mobile application for data collection

Lab
Advanced diagnostics and prognostics engines

- Asset diagnostics
- Dynamic loading
- Digital twin
- Predict failure & end-of-life

100+ asset models (FMEA, Health, Recommendations, Maintenance Plan)

CORE FUNCTIONALITY

DATA PROCESSING
- Data integration & storage
- Online monitoring integration
- Data classification, preparation, persistency
- Big data processing

CYBERSECURITY
- Logging
- Access control (ABAC, RBAC)
- Secure data at rest & in transit

ALERTS
- Critical events
- Alarms and events
- Offline alarm

INVENTORY
- Installed base
- Spares quantity (EnergyFIT)
- Spares cost

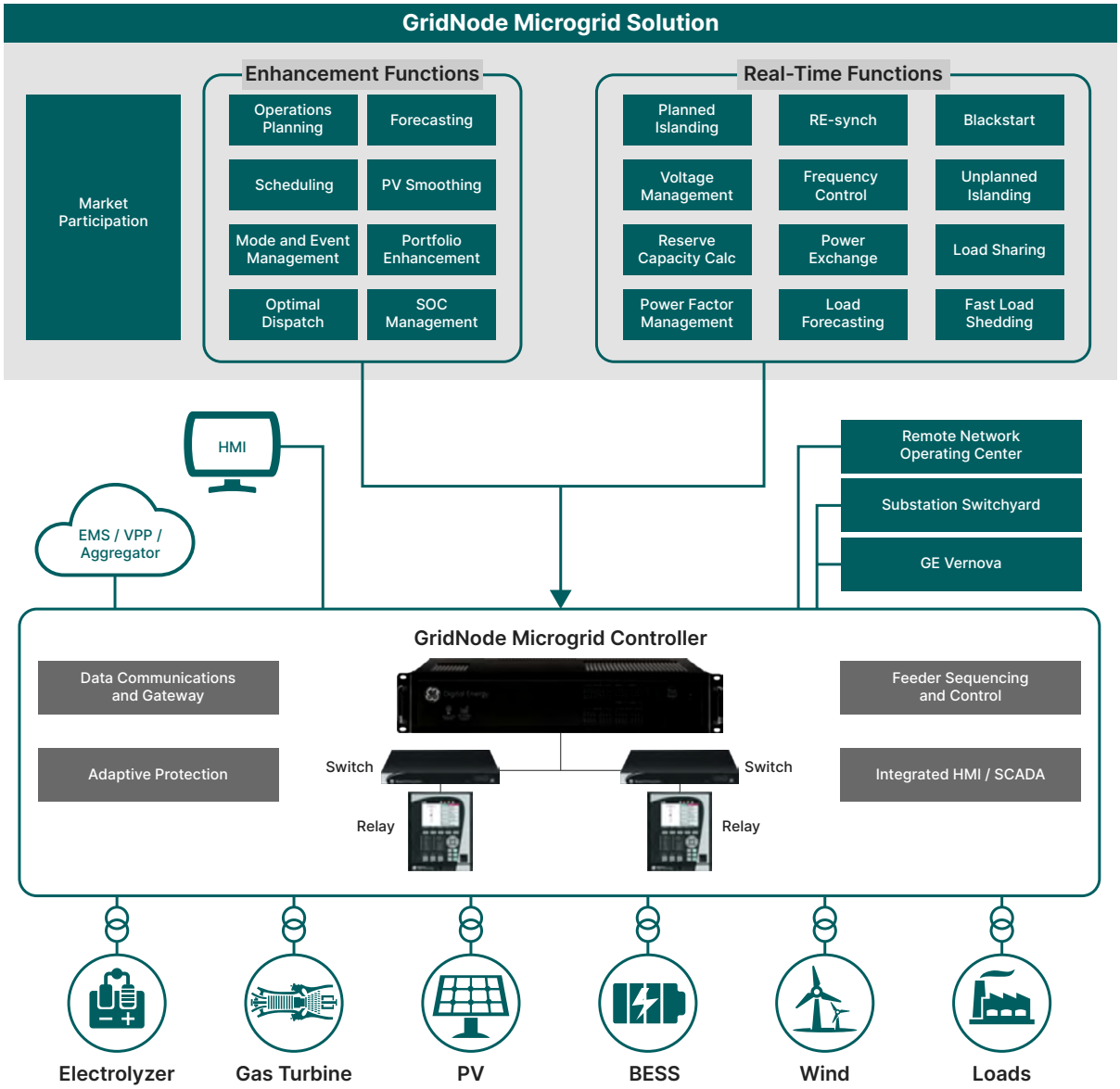
Advanced Automation Applications

Real-time control and advanced electrical control solutions can help operators increase return-on-investment (ROI) through reduced unplanned downtime and market participation.

GE Vernova's microgrid & industrial power management solution offers real-time control and energy improvement to boost ROI, seamlessly integrate renewables, and support decarbonization goals. Oil & gas operators can operate their facilities in grid-connected or islanded mode. The solution enables improving asset operation performance, reduced downtime and participation in ancillary services such as demand response and peak shaving to comply with grid regulations and increase revenue.

The DER management solution manages active/reactive power, power factor, and voltage at the point of interconnection, improving renewable energy integration. Additionally, GE Vernova's industry-leading fast load shedding solution lowers unplanned downtime and high electricity costs, operating in as little as 15ms and ensuring system stability during critical situations. The solution provides real-time capabilities to unify load management and advanced electrical control and monitoring for your project.

Electrical Control System (ECS) is a complete solution that includes software and distributed logic for the automation and monitoring of electrical systems. ECS collects, controls, and monitors electrical data from electronic devices, such as protection and control relays from HV Switchyards to LV motor starters and DC/UPS sub-distribution. The multiprotocol ECS platform provides the flexibility and scalability necessary to integrate multivendor devices, and a level of adaptability that allows it to be used regardless of scope, integrating from 1 to 1,000 devices. With ECS, processing and electrical worlds are independent, all the while remaining highly integrated, using the same control room engineering and operator workstation HMIs, alarm management system, and historian.



Energy Efficiency

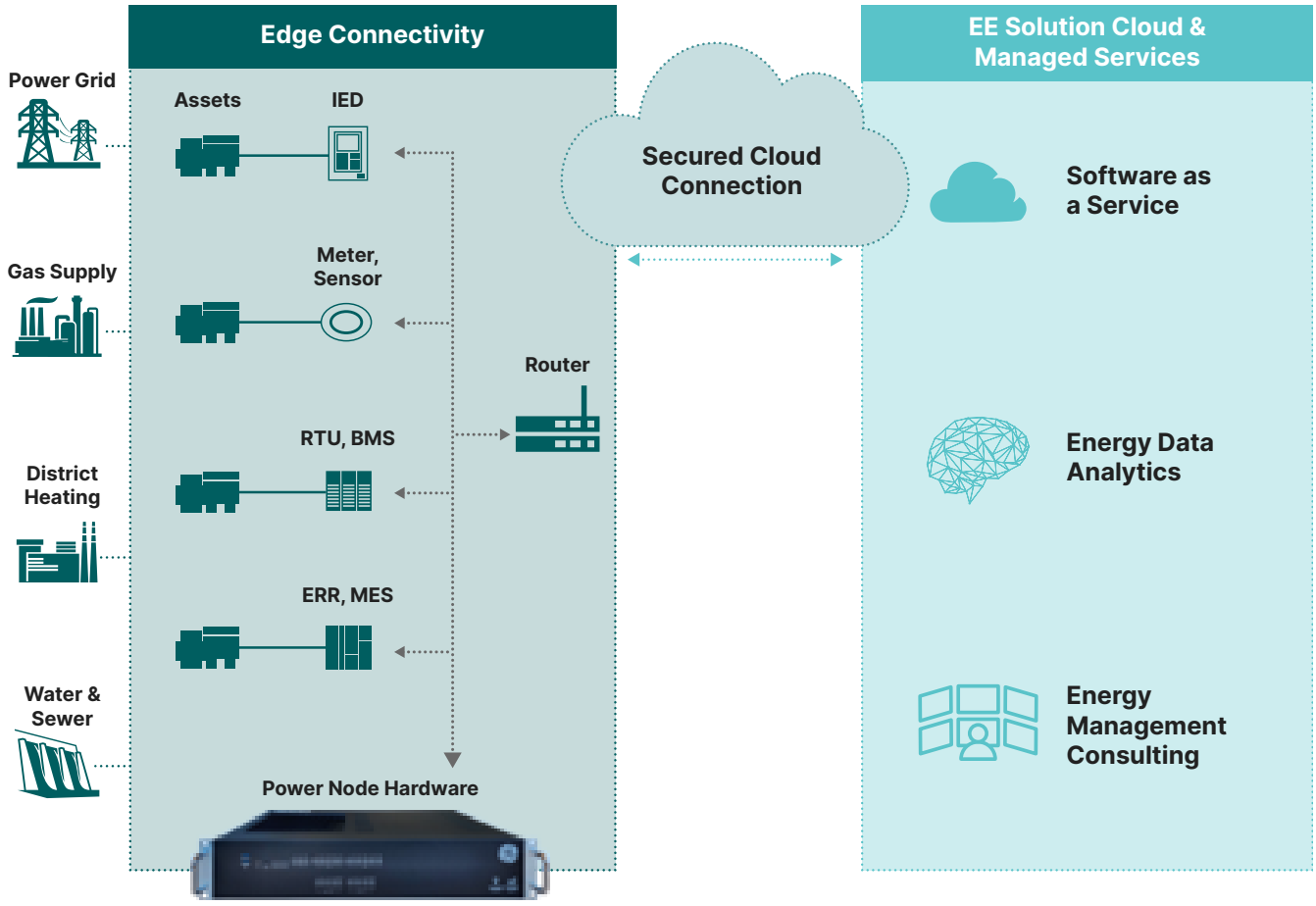
Monitor energy consumption, reduce costs, and track associated greenhouse gas (GHG) emissions for the facility.

Energy costs are significant expenses for utilities and industries at large, particularly those that are energy-intensive or operate heavy machinery. Between 5% and 25%* of the expenses in these organizations are allocated to energy payments, with up to 15%** of this energy consumption being wasted during operations.

GE Vernova's Energy Efficiency Software (EES) solution revolutionizes the management and efficiency of energy consumption while effectively curbing GHG emissions, propelling organizations towards a more sustainable future. The robust and scalable EES system architecture integrates data from various sources, including sensors, meters, and IoT devices, to provide real-time energy monitoring. It leverages advanced algorithms and cloud-based infrastructure to enable seamless data analysis, decision-making, and energy management across industrial and infrastructure facilities.

Key Features

- **Customizable Dashboard:** The EES solution uses a cloud-based application to store and display data for analytics and monitoring. The EES dashboard personalizes the user experience by tailoring data views based on individual preferences. Users can select and share a range of widget types for effortless collaboration.
- **Energy Performance Indicators:** Easily create and configure energy performance indicators using any type of data, giving the power to track the most important business metrics.
- **Energy Data Management:** The EES solution relies on efficient energy data management, allowing for the collection, analysis, and utilization of energy data. It enables detailed insights into energy consumption patterns through meter interval data calculation. Advanced analytics are utilized to identify anomalies, promptly notifying users of overconsumption or deviations.
- **Managed Services:** Services include site audits, energy performance follow-up and benchmarking to evaluate energy performance against industry standards.



*Source: CaixaBank Research
**Source: IEA (International Energy Agency)

Protection, Control & Monitoring

Enhance reliability of your critical assets and reduce cost of unplanned downtime through advanced diagnostics, monitoring and predictive maintenance.

Protection Relays and Power Quality

Our digital relays protect vital equipment, reducing downtime with advanced diagnostics and predictive maintenance features. GE Vernova's feeder protection systems provide flexible and programmable protection for switchgear across voltage levels, with high-speed tripping and arc flash sensor technology reducing damage and downtime in critical situations. The motor protection systems use advanced thermal modeling to provide enhanced protection and ensure highest process uptime.

GE Vernova's metering devices ensure reliable and efficient energy use, improving power quality through cost-saving solutions like harmonics monitoring and voltage balance.

Digital Substation Solutions

GE Vernova's digital substation solutions convert analog data into digital for seamless real-time transmission and sharing across devices and substations. This enables reduced CAPEX, faster deployment, improved reliability, and enhanced system awareness. By using IEC 61850 communication protocols, it allows for greater interoperability and lowers the total cost of ownership. With over 100 digital substation projects in 27 countries, GE Vernova's expertise helps oil & gas operators future-proof their electrical grids and improve asset utilization.

Key Benefits

- Reduce CAPEX by eliminating duplicated hardware (CT, VT are no longer required)
- Improve workforce safety (miles of copper wires are replaced with fiberoptic cables)
- Reduce substation footprint by up to 50% through a smaller control room
- Reduce engineering work through simplified system drawings
- Easier, faster, and remote commissioning/testing
- Improve system reliability through increased situational awareness and asset utilization

Industrial Communications

Provide advanced communications solutions for the oil & gas industry, designed to enhance reliable, flexible communications across plant and field operations.

Harsh environments demand communication solutions that have been designed to perform reliably in extreme operating conditions.

From production to processing to transportation, GE Vernova provides oil & gas companies with the communication products and services to meet their demanding and diverse network requirements.

Our reliable, secure communication solutions are essential for ensuring data flow between devices and maximizing process uptime. GE Vernova offers a wide range of solutions, including wireless routers and modems, optical edge technologies, cellular routers and gateways, TDM & packet transport, and high-density Ethernet switches and converters.

Upstream Production

- Transmit tubing and casing pressure from gas wellheads to RTUs and flow meters
- Data acquisition for dynamometer data, pump-off controllers and RTUs
- Data collection for production pad tank levels and compressor pressures and status
- Deliver actionable wellhead and production pad data to enterprise control centers
- Support multiple wireless options on a common infrastructure for local WiFi and high-speed Ethernet connectivity

Processing

- High-capacity wireless backhaul infrastructure supporting data, voice and video communications
- Remotely monitor pressure, temperature and level data from facility perimeter
- Provide wireless LAN communications for facility control, operations and maintenance requirements
- Fiber communication for operation, maintenance, for protection and control of facility power grids

Midstream/Transportation

- Collect compressor inlet, discharge pressure, and status values.
- Long-range connectivity to production pads, pump
- and compressor stations, block valve sites for real-time monitoring and control.
- Remote data collection from meters and flow devices for intrusion and leak detection over remote pipelines
- SCADA communication to flow meters and RTUs for custody transfer, intrusion and leak detection
- Aggregate SCADA, voice and security data on a common fiber network

Transportation

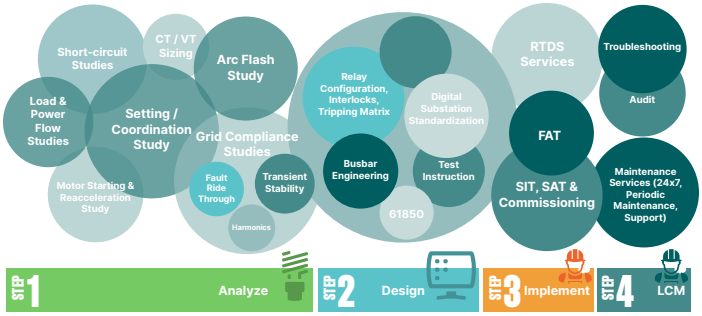
- Remote monitoring of pipeline flow and status signals
- Voice, data, CCTV, IP/Ethernet telecom services for hydraulic control, leak detection, pipeline SCADA, security and safety sub-systems
- Provide SCADA communication for flow meters, RTUs and controllers for custody transfer, storage, cathodic and leak detection
- Communication to terminal facilities and marine centers for spill recovery and coast-guard
- Long-range wireless communication between off-shore production to transportation terminals

Engineering & Consulting Services

Design and execute a comprehensive service strategy that is tailored to meet specific project needs, with the objective of best-in-class performance and long-term success.

GE Vernova Grid Automation's technical consulting services team provides a wide range of end-to-end capabilities to assist you with power protection, substation automation, and monitoring and diagnostics challenges. From new installations to upgrading an existing system, our consulting team has been trusted to analyze, design, and implement modern power systems.

What sets us apart is our commitment to a complete life cycle approach right from real-time simulations, network studies, testing & commissioning support. We understand that successful projects require seamless coordination and collaboration across various phases. By offering end-to-end solutions, we eliminate the need for multiple suppliers or consultants, providing oil & gas companies with a streamlined and efficient experience. Our team possesses the expertise and experience to navigate the complexities of every project stage, from engineering design to commissioning, ensuring successful outcomes.



Cybersecurity

To protect critical industrial assets and systems from the increasing threat of cyberattacks, GE Vernova offers innovative cybersecurity solutions to increase operational integrity, comply with regulations and control costs of security.

Key Features

- Centralized users, roles, and password management
- Centralized logging of security events through SYSLOG
- Intrusion detection system
- Network segregation with VLANs and firewalls
- Centralized anti-malware management
- Security updates

Key Benefits

- Increased security with multi-layered approach
- Interoperability with use of standard protocols
- Faster incident response with enhanced monitoring capabilities
- Assists in compliance for regulatory and international standards, such as NERC Business

For more information visit
www.gevernova.com/grid-solutions

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