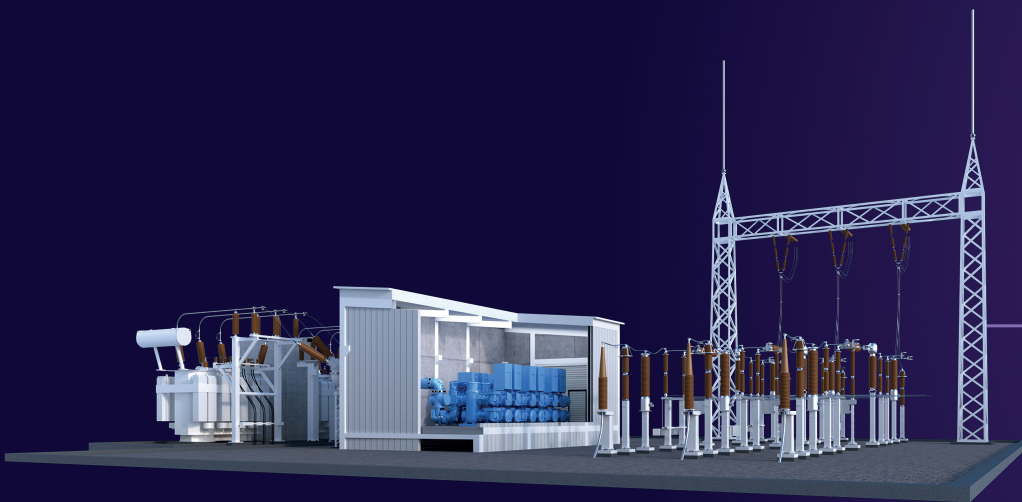




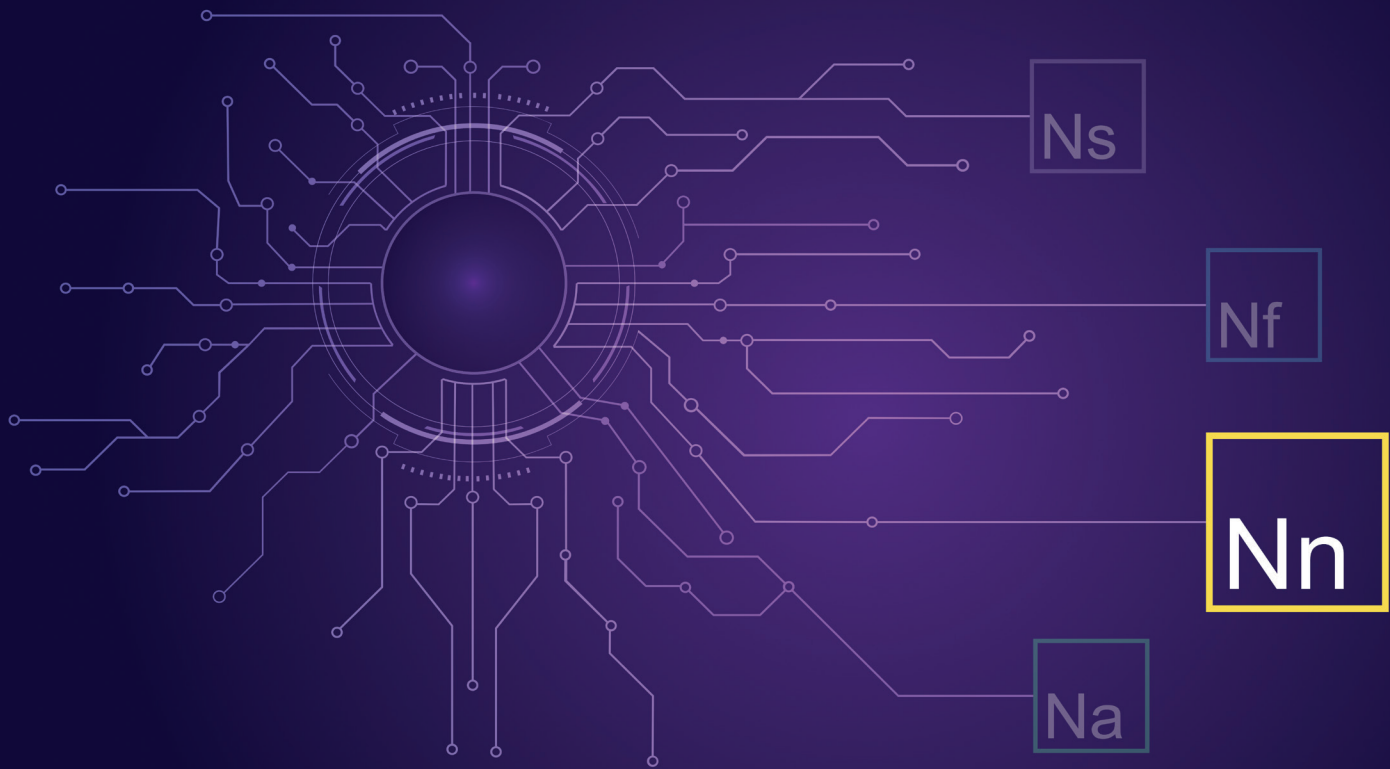
# Switchgear digitalization

**Noedra Node suite for substation digitalization**

Listen to the grid's heartbeat.



**Noedra Node**  
Substation Digitalization



## The Noedra framework

Noedra is Siemens Energy's digital framework - the Mind of the Grid - connecting Grid Technologies' intelligent solutions, from sensing and control systems to software and advisory, into one coherent ecosystem.

By transforming data into clarity, coordination, and confident action, Noedra enables operators to manage grid complexity with intelligence and control.

Each Noedra suite represents a specific way this intelligence acts across the grid.

Together, they protect, sense, connect, and foresee the grid of today and tomorrow.

## Node suite - Intelligence inside the substation

Within the Noedra ecosystem, Node brings intelligence inside the substation.

The Node suite focuses on substation digitalization, integrating sensing, inspection, predictive analytics, protection, and automation into a coordinated layer of intelligence.

Connected with the other Noedra suites, Node transforms visibility into foresight - enabling substations to monitor their condition, anticipate risks, and support confident operational decisions.



# From switchgear condition to operational confidence

Substations are the core of the power grid. Their health determines the stability, safety, and reliability of power transmission and distribution. But operators today face mounting challenges:

- Ageing assets and infrastructure.
- Increasing demand and fluctuating loads.
- Integration of renewables and distributed resources.
- Rising requirements for transparency, safety, and reliability.
- Pressure to reduce outages, maintenance costs, and environmental impact.

Traditional inspection and maintenance methods provide limited visibility and are often reactive.

Without continuous condition insight, early signs of degradation can remain unnoticed until failures occur.

The Noedra Node Suite for Switchgear digitalization addresses these challenges by delivering continuous monitoring, advanced diagnostics, and predictive intelligence - enabling operators to move from reactive intervention to proactive, data-driven asset management.

# Our solutions

Switchgear is the backbone of safe and reliable grid operation - but ageing assets, rising load demands, and the complexity of renewable integration are pushing traditional maintenance to its limits. Mechanical wear, insulation degradation, or gas leaks can escalate quickly, causing costly outages and safety risks.

The Noedra Node suite changes that. It continuously monitors the mechanical, electrical, and insulation health of switchgear - identifying anomalies early, reducing forced outages, and streamlining maintenance across both Air-Insulated (AIS) and Gas-Insulated Switchgear (GIS) environments. With real time condition monitoring, advanced diagnostics, and predictive analytics, operators gain the actionable insight needed to intervene before issues escalate and asset performance is compromised.

## Key features & benefits



### Mechanical

Manages alarms and notifications with intuitive HMI visualisation and high-frequency sampling at 10 kHz. It monitors coil and motor currents, evaluates contact wear, and assesses overall breaker health. Using advanced signal processing, it identifies failure modes, recommends corrective actions, and provides prognostics such as total  $i^2t$ , fault currents, operation counts, and motor/travel curves - enabling early anomaly detection and precise fault classification.



### Insulation Condition

Monitors SF<sub>6</sub> and clean air insulation to safeguard asset integrity and ensure full environmental compliance. The system includes self diagnostics, predictive alerts such as time to next alarm, and a dedicated maintenance mode for SF<sub>6</sub> handling. It detects leakage through density trend analysis, supports gas inventory management, and provides a comprehensive GIS system view with mechanical lifetime tracking. The result: early detection of gas related failures, minimized environmental risk, and prevention of insulation driven failures.



### Electrical

Provides pattern diagnostics through an expert interface with multi-channel visualisation. Uses neural network pattern recognition for root cause analysis and maps PD activity to the single-line diagram for precise localisation. Integrated alarm and notification management ensures early detection of insulation issues. Detects partial discharge as an early sign of electrical insulation failure, enabling accurate fault localisation.

# Technical highlights

Integrated, real-time condition monitoring across key switchgear assets Siemens Energy delivers end-to-end, real-time monitoring for gas density, partial discharge, and circuit breaker performance. This integrated approach enables predictive maintenance, improves operational efficiency, and enhances safety across both Air Insulated (AIS) and Gas Insulated Switchgear (GIS). With seamless data acquisition, advanced analytics, and secure remote access, the system strengthens reliability and extends the lifecycle of high voltage assets.

## Advanced diagnostic and prognostic capabilities with expert systems

Our modular monitoring solutions - mechanical, insulation condition, and electrical - incorporate sophisticated diagnostic tools, including:

- Pattern recognition and root cause analysis using neural networks (especially in electrical).
- High-frequency signal sampling (up to 10 kHz) for detailed event capture (in mechanical & thermal).
- Predictive features such as “Time to Next Alarm” and trend analysis for proactive maintenance planning (in insulation coordination).

## Connectivity & security

The platform supports encrypted data transmission to web and mobile dashboards, read only secure gateways, and seamless API integration with SCADA and asset management systems. It is compatible with key industrial protocols – including Modbus-RTU, Modbus-TCP, IEC 61850, OPC UA (optional via gateway: DNP3, IEC60870-5-104).



# Why Siemens Energy

Choosing Siemens Energy means partnering with a global leader committed to powering progress and shaping a sustainable energy future. More than a technology provider, we bring vision, reliability, and long term partnership - helping you navigate the evolving energy landscape with confidence.

## Proven expertise:

Benefit from decades of experience in power systems and grid modernization, ensuring reliable and forward-thinking solutions.

## Global reach:

Leverage our worldwide presence and deep industry knowledge to address local requirements while meeting global standards.

## Tailored solution:

Our teams collaborate closely with customers to deliver solutions customized to your unique operational needs.

## Trusted partnership:

Rely on Siemens Energy as your advisor, dedicated to building long-term relationships and supporting your journey toward a reliable, secure, and sustainable energy future.

## Continuous innovation:

Experience ongoing support and innovation, ensuring your organization stays ahead in a rapidly.

## Turn switchgear condition into operational confidence.

Bring visibility, intelligence, and foresight to AIS and GIS environments with Noedra Node.

Discover Siemens Energy's integrated solutions for digital substations.



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Siemens Energy Global GmbH & Co. KG  
Grid Technologies  
Siemens Promenade 9  
91058 Erlangen, Germany

For more information, please visit our website:  
[siemens-energy.com](https://www.siemens-energy.com)  
or contact us  
E-Mail: [support@siemens-energy.com](mailto:support@siemens-energy.com)  
Phone: +49 911 6505 6505  
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