PRO INTEGRIS
A Siemens Energy Business

SIEMENS energy

Building the grid of the future

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CIGRE 2025

Siemens Energy is a **global leader** in the **energy business**

~1/6
of global electricity generation is based on our technology.

~100,000
employees work as a team to energize society.[1]

We are present in
>90 countries.

We invest around
€1 bn annually in research and development.

1 Number of employees as of August, 2024

As an integrated energy technology company

we support our customers along the energy value chain

Low- or zero-emission power generation

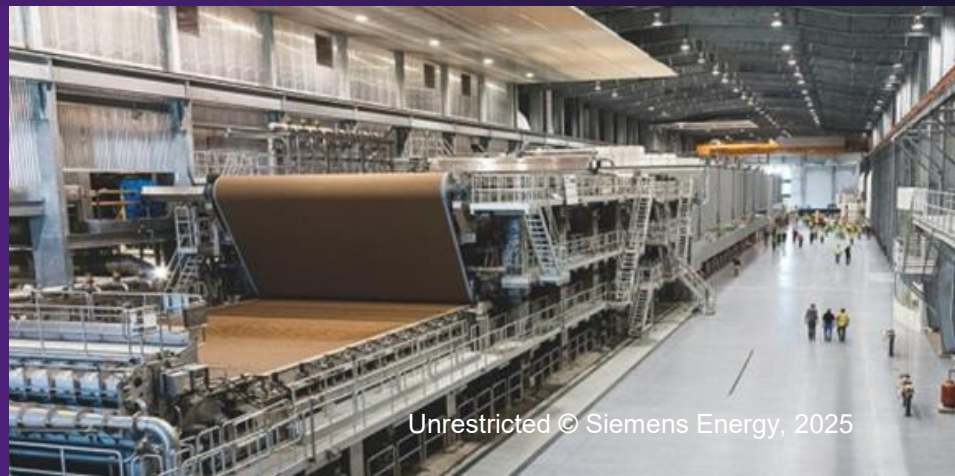
- Gas Services
- Siemens Gamesa

Transport and storage of energy

- Grid Technologies

Reducing GHG emissions & energy consumption in industrial processes

- Transformation of Industry



We enable a reliable, sustainable and digital grid
through a strategic leading portfolio

Our grid technology portfolio

- Grid Consulting
- Grid Enhancing Technologies
- Grid Automation
- Grid Cybersecurity

- High-Voltage Direct Current (HVDC) – onshore & offshore
- Flexible AC Transmission System (FACTS)
- Substations – onshore & offshore
- Medium-Voltage Direct Current (MVDC)

- Power and Distribution Transformers
- Bushings, Instrument Transformers & Coils
- Renewables & Traction
- Switchgears
- Product bundles and systems

- Turnkey battery energy storage solutions (grid connected and off-grid)

- Product services
- Modernization and upgrades
- Long-term service concepts and grid integration

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Pro Integris: DG's competence hub to deliver substation automation offerings around the world

Pro Integris contributes to system level of DG stack

Overarching layers

Advisory

Grid Level

Network Management

System (station) level

Substation Automation

Asset level

Asset Digitalization

18

years of operation

in Croatia and Singapore, with a special focus on substation automation systems

12+

years as go-to-partner

for SE and successful track-record of delivering projects globally

2

offices

In Croatia, 4 globally

80+

employees

and a strong partner network to tap into

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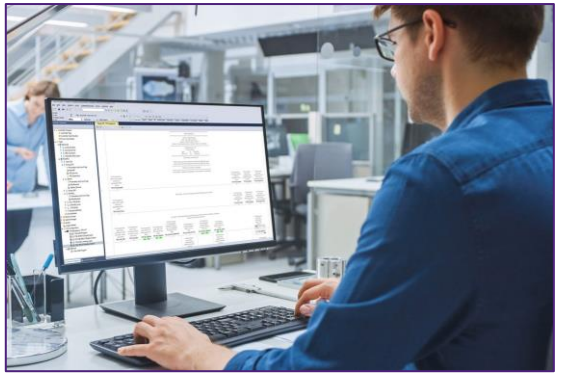
With Pro Integris, DG is vendor-agnostic and can address complete substation automation value-chain

Design and engineering



- Basic and detailed design for **primary and secondary systems** in a substation

Cubicle manufacturing and delivery

- Cubicles design, assembly and delivery by **leveraging regional partners**

PAC and SCADA parameterization

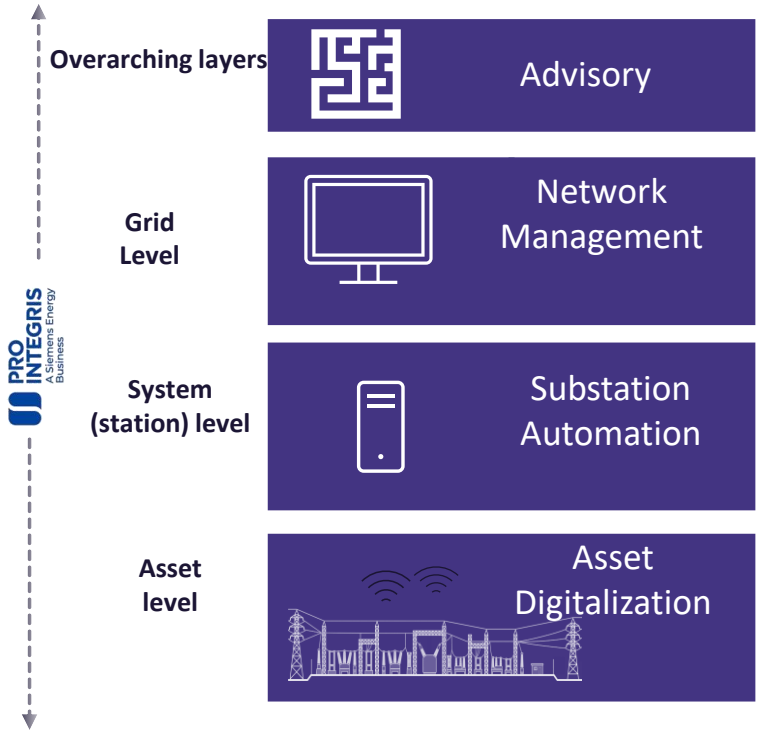
- **Configuration** and **testing** of protection system, interlocking and system integration

Commissioning and training

- Preparation of **FAT** and **SAT** protocols, **on-site** supervision of commissioning and testing

DG/Pro Integris is equipped to address emerging challenges and enable customer's digital journey across all grid layers

Pro Integris will address all levels of DG stack



DG/ Pro Integris Portfolio

- **Grid Consulting**
- **Cybersecurity**
- **Grid Automation**
- **Grid Automation**
- **Grid Enhancing Technologies**

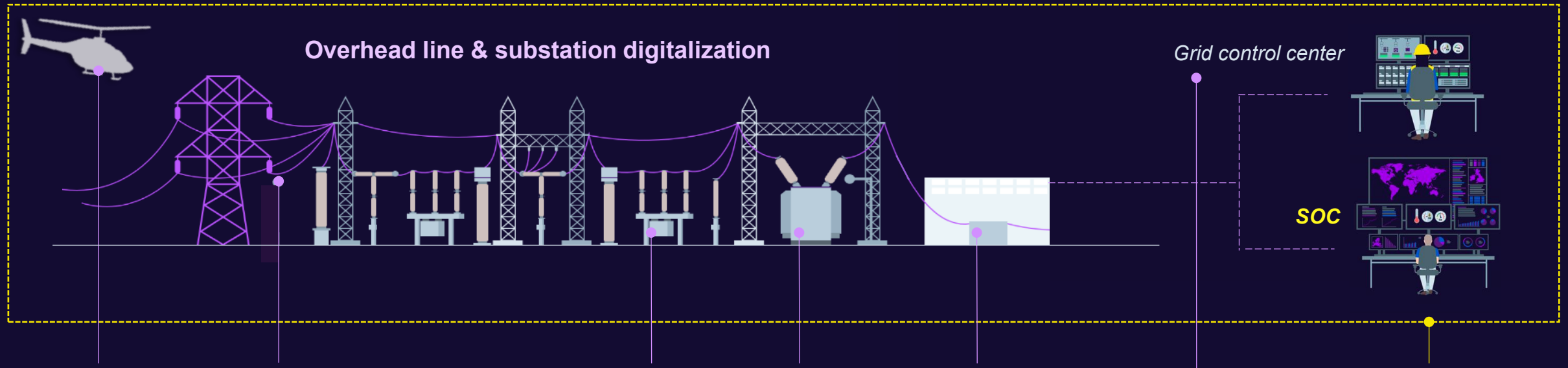
Portfolio features

- Expert-driven **grid studies** and **techno-economic** consulting
- Solutions for **secure operation** of digitally connected assets
- Partnerships to integrate **modular grid management software**
- Vendor-agnostic, end-to-end offering for **digital substation**
- **Asset monitoring and performance management** with OEM-developed digital twins

Advanced digital solutions for unmatched performance and reliability at all levels

Holistic network planning & consulting services

1. Operation & Transformation
2. Investment Planning
3. Feasibility Check
4. Pre-FEED Advisory
5. FEED Support



AI-based OHL inspection

Dynamic line rating for OHL

CB/Switchgear digitalization

Transformer digitalization

Substation Control & Protection

- Design and eng.
- PAC HW (relays, controller, MUs)
- HMI & SCADA

Grid management software

Grid cybersecurity

- GAP compliance & risk assessment
- Substation cyber solution
- OT/ICS technology solutions & systems integrations

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Grid Enhancing Technologies

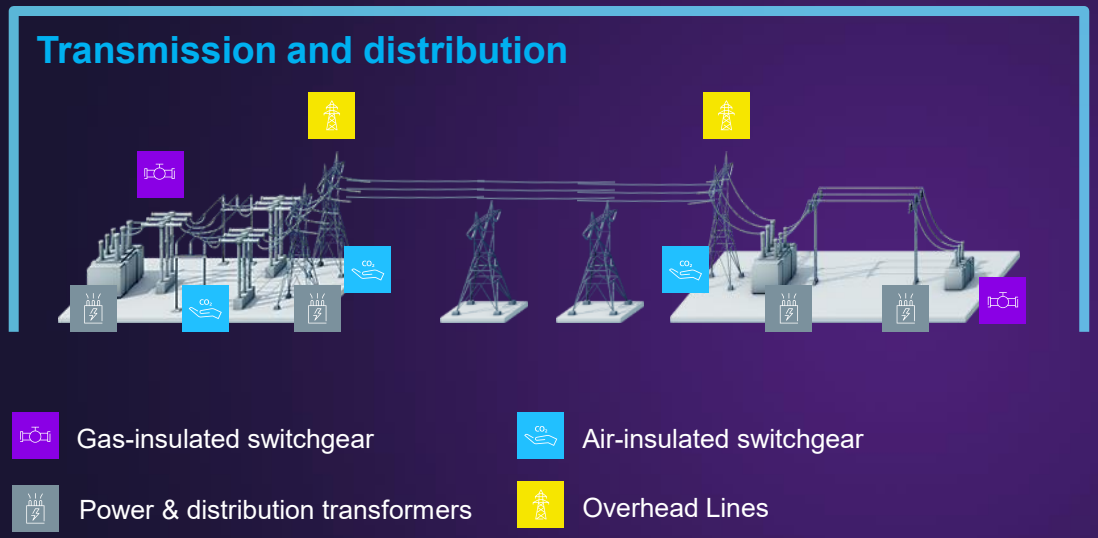
Siemens Energy monitors the transmission grid from end-to-end

As GET, we focus on asset monitoring and its integration within and across substations

DG GET Portfolio

- Asset Digitalization and Connectivity
- Condition Monitoring, Diagnostics, and Assessment Management
- Availability and Maintenance Plan Optimization
- Grid Level Dynamic Operational Performance

Full coverage of electricity transmission value chain



Our Technology covers diverse areas

Asset Digitalization and Connectivity

By using advanced sensors with real-time data monitoring systems, our solution provides valuable insights into the operational status and health of critical asset

Condition Monitoring, Diagnostics, and Assessment Management

Utilizing advanced engineering models, statistics, and machine-learning techniques, combined with the implementation of Digital Twin technology ,our products transform pre-established operational limits into a dynamic condition and operational behaviour recognition system

Availability and Maintenance Plan Optimization

By leveraging real-time data, predictive analytics, and OEM expertise, along with advanced inspection technologies, it is assured an accurate and up-to-date asset information, supporting maintenance planning, efficient crew dispatches, and precise condition assessments.

Grid Level Dynamic Operational Performance

By combining the Substations and Overhead Lines Digital Twin with the real-time data of the assets' conditions and its surroundings, our solution enables forecasting of the most optimized use of the Grid and avoids congestions.

Power Transformer Monitoring & Diagnostics

Enhance your operational transparency, sustainability, reliability, and resiliency

Accurate diagnostics and predictive analyses based on Siemens Energy OEM algorithm

Flexibility to be applied on all transformers, from any manufacturer, of any age

Fleet evaluation capabilities for single or multiple substations

Visualization in an intuitive web application or integration to your own dashboards via APIs

Sensformer®

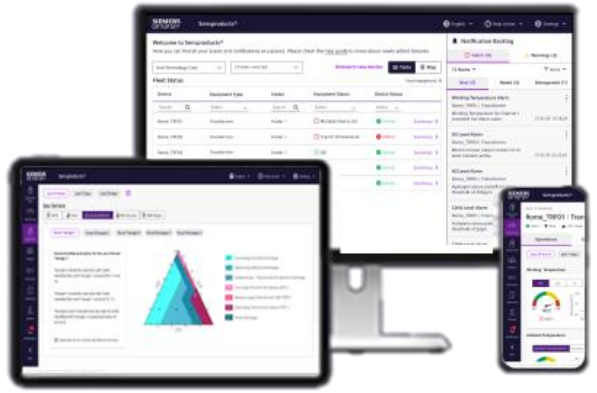
With our full solution it is possible to Integrate real-time data **monitoring**, advanced **diagnostics** and **simulated** scenarios

- ✓ DGA statistic evaluation and diagnostic
- ✓ Bushings relative deviation of capacitance
- ✓ Moisture measurements and evaluation in insulation
- ✓ Static and Dynamic Overload Guide
- ✓ Cooling system condition
- ✓ Electrical Partial discharge via Bushing
- ✓ OLTC motor drive torque and diverter switch contact's wear

Sensformer® LITE

With our LITE solution a hassle-free self-installation is possible. It has competitive pricing, minimal to zero downtime, and suitable for all oil-immersed power and distribution transformers

- ✓ Oil Level
- ✓ Current in modelled winding
- ✓ Ambient Temperature
- ✓ Pump Signal
- ✓ Top and Bottom Oil Temperature
- ✓ Static Overload Guide



Intended Benefits

- ✓ Optimizing maintenance with condition-based strategies and enhancing knowledge of operative conditions
- ✓ Early identification of faults that allows preventive actions to avoid costs with catastrophic faults
- ✓ Simulation provides insights into real load conditions and manages temporary overloads
- ✓ Relative Aging calculates life loss from past operations, displays real-time aging by day, month, or lifetime, and helps determine a more accurate resale price
- ✓ Virtual sensors offer detailed operational status information and accurately identify temperature hot spots

Switchgear Monitoring & Diagnostics

Mastering the lifecycle management through real time data transparency

Precise and efficient decision-making processes regarding maintenance and operations

Flexibility to be applied on Switchgears from any manufacturer, of any age

Precise diagnostics failure modes

Full on-premise systems as well as intelligent **cloud**-connected systems

Intended Benefits

- ✓ Equip your GIS / AIS with state-of-the-art sensors and increase the efficiency and precision of your maintenance and operation decisions
- ✓ By enabling early identification of gas leaks, enhances safety and helps prevent unplanned downtime
- ✓ The early detection of electrical discharges within the insulation, prevents failures, enhancing reliability, and ensuring the safety and longevity of electrical equipment
- ✓ When tracking the performance of the asset, it is possible to detect anomalies, which increases the electrical system reliability, safety and operational efficiency

Gas Density Monitoring

With our GDM solution, it is possible to track SF6 / clean air levels to ensure optimal insulation, enabling early identification of gas leaks.

- ✓ Gas Density
- ✓ Gas Pressure
- ✓ Gas Temperature
- ✓ Trend analysis
- ✓ Gas Inventory

Partial Discharge Monitoring

With our PDM solution, the detection of faults becomes highly accurate, delivering a comprehensive early warning system to prevent failures in GIS.

- ✓ Ultra High Frequency sensor
- ✓ Phase resolved Partial Discharge
- ✓ Single-Line Diagram fault location
- ✓ Advanced Diagnostics via Pattern Recognition Model
- ✓ Expert view with recording functionality

Circuit Breaker Monitoring

With our CBM solution, performance metrics are tracked, anomalies detected, and timely maintenance ensured for HVC Circuit Breakers.

- ✓ High Frequency sampling: signals acquired from field at 10kHz and plotted at HMI
- ✓ Coil and motor currents monitoring
- ✓ Advanced Signal Processing including failure mode description, recommended actions, and prognosis (i.e. total i2t and fault currents, operation count, Motor & Travel curve…)

Overhead Lines Monitoring & Diagnostics

Optimize the capacity of your lines

Dynamic Line rating – real time analysis and forecasting

Real-time Line Sag & Clearance Calculation

Icing & de-icing detection

API integration with external systems

Gridpulse®

Solution that enhances performance by utilizing real-time data analysis and forecasting to enable an optimized capacity of overhead power lines

Gridpulse® Base sensors

- ✓ Line Current and Voltage
- ✓ Conductor Temperature
- ✓ Conductor
- ✓ Inclination
- ✓ Ambient Temperature

Gridpulse® WEATHER station

- ✓ Ambient Temperature
- ✓ Wind speed & direction
- ✓ Solar radiation

Inventory of OHL Components

Inspection of visual defects

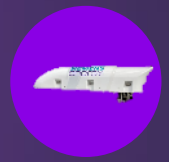
Clearance distance to vegetation and tree fall Simulation

Surveying Corridor 2D/3D surveying

SIEAERO

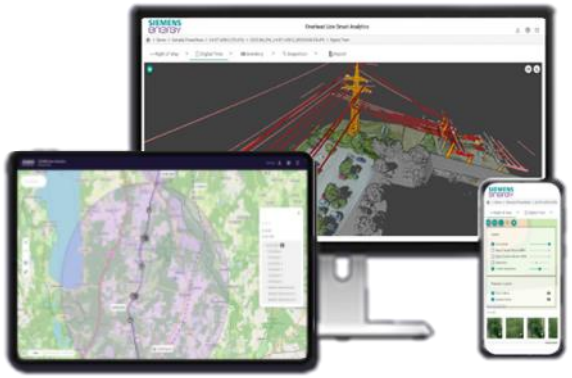
Capture real world information of the overhead lines and its environment, providing a comprehensive and easily accessible information for a data-driven decision process

4-in-1 SIEAERO sensor



- ✓ Visual Sensor
- ✓ Lidar Sensor
- ✓ UV Sensor[1]
- ✓ Thermal Sensor[1]

1 In development



Intended Benefits

- ✓ Real-time data empowers informed decisions, ensuring efficient resource allocation and long-term infrastructure development
- ✓ By identifying potential faults or failures in advance, line monitoring can help prevent accidents caused by system failures, enhancing safety for both workers and the public
- ✓ With the 360° field inspection aerial tool combined with the SIEAERO analytics solution, real world information of the lines and its environment is captured and represented within the digital domain
- ✓ Real-time performance data & dynamic line rating allow operators to maintain the stability of the grid and improve overall system utilization and efficiency by managing the power flow
- ✓ With real-time and predicted performance data, grid resilience can be strengthened, and downtimes can be minimized by promptly addressing system vulnerabilities
- ✓ The combined solution optimizes asset use and defers infrastructure spending, yielding significant long-term cost savings

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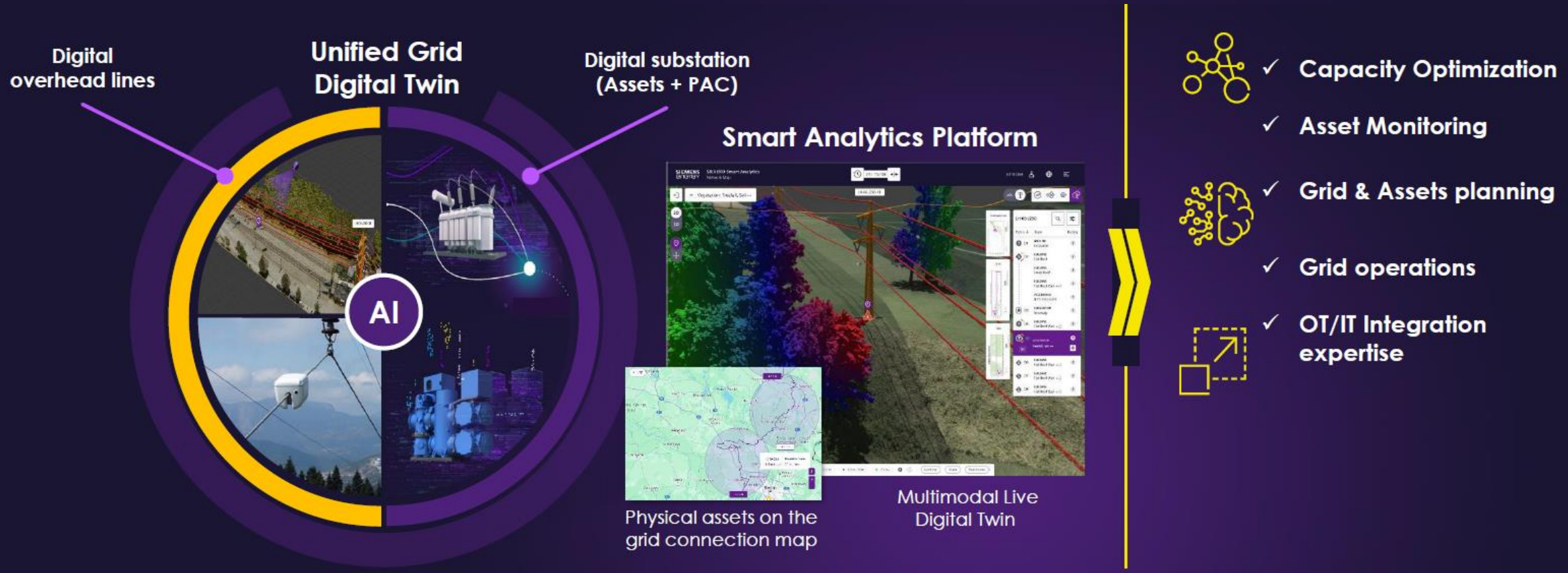
Grid Enhancing Technologies' synergies

End-to-end integrated digital solutions for overhead lines and terminal equipment are enabling smarter, more resilient transmission and distribution (T&D) power grid systems.



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Grid Automation

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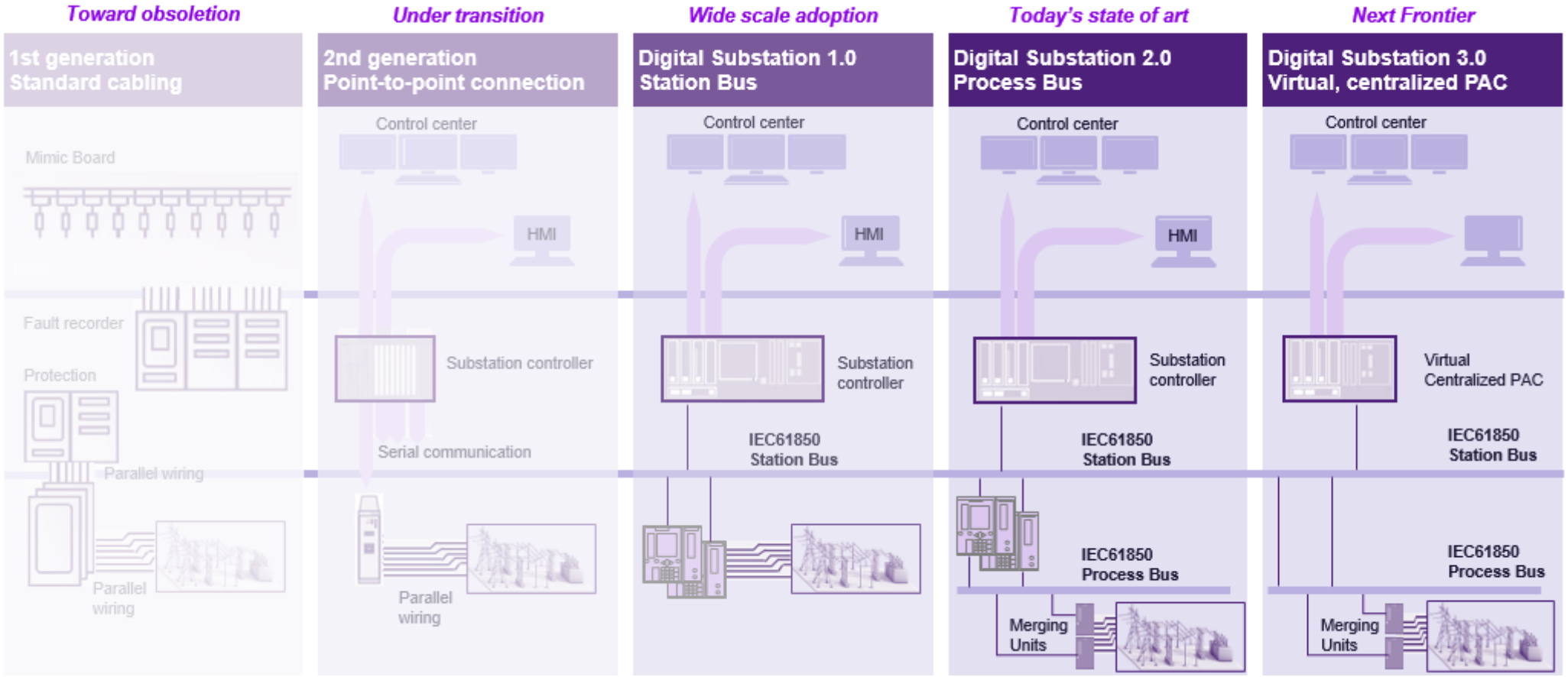
Control and protection systems are quickly evolving to become more digitalized



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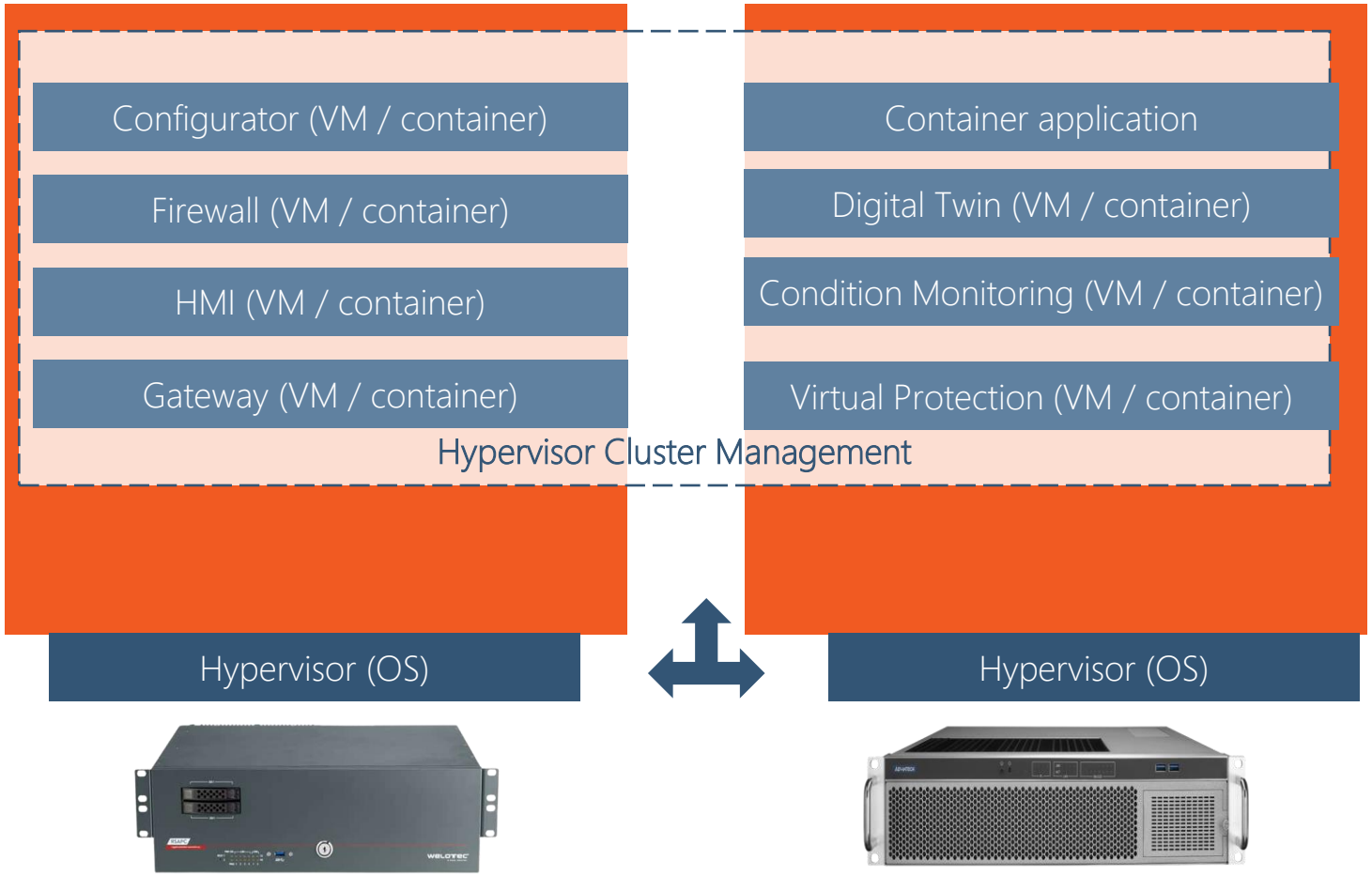
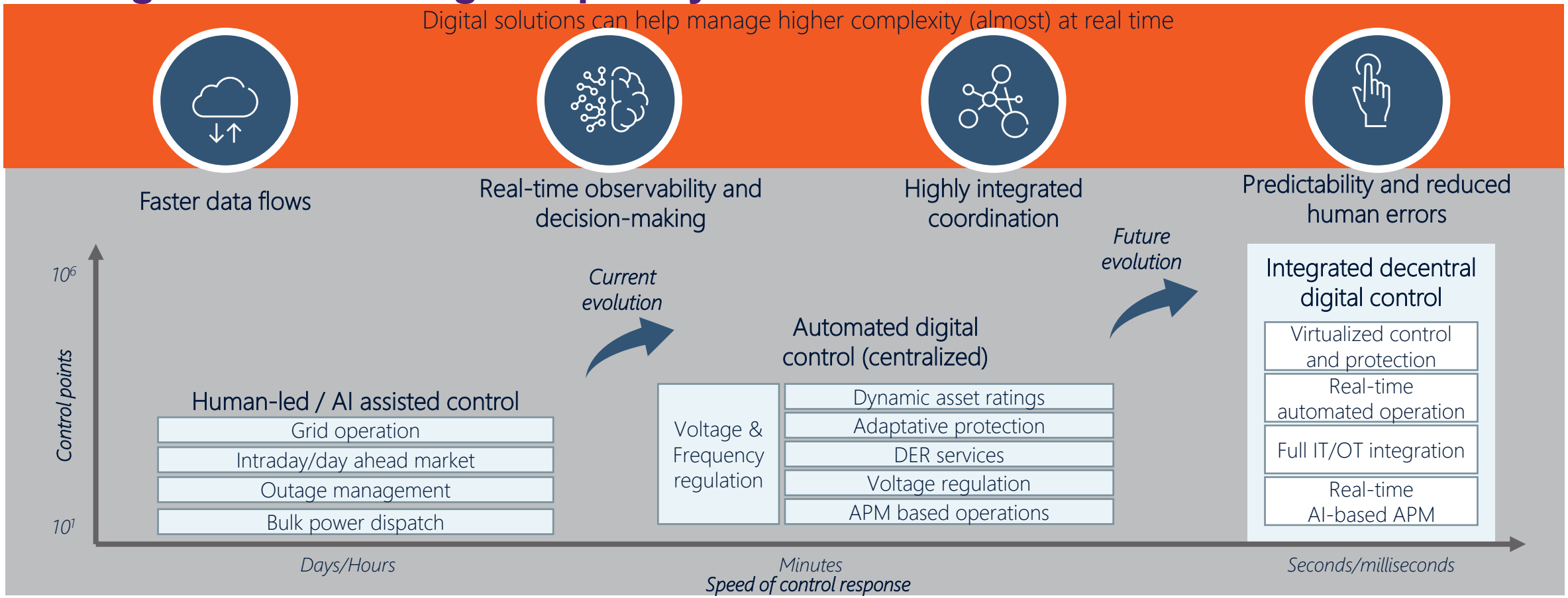
vPAC offers more flexibility, enabling seamless integration of diverse functionalities within the substation environment



Key takeaways

- Consolidate multiple legacy substation devices under one hardware device.
- Remote asset and apps management through VM centralized asset management tools.
- Allows utilities to deploy the same components across its fleet and customize only the applications needed in the VM/ containers.
- Prepare for future workloads and expand without any / no significant changes.
- How can analytics, together with digitalised infrastructure and integrated platforms, help bring asset management and PAC functions closer together?

The change in the grid is forcing the adoption of digital solutions to manage the increasing complexity



Source: Edison Electric Reimagining the Grid

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Technology enablers

Virtualisation & vPAC

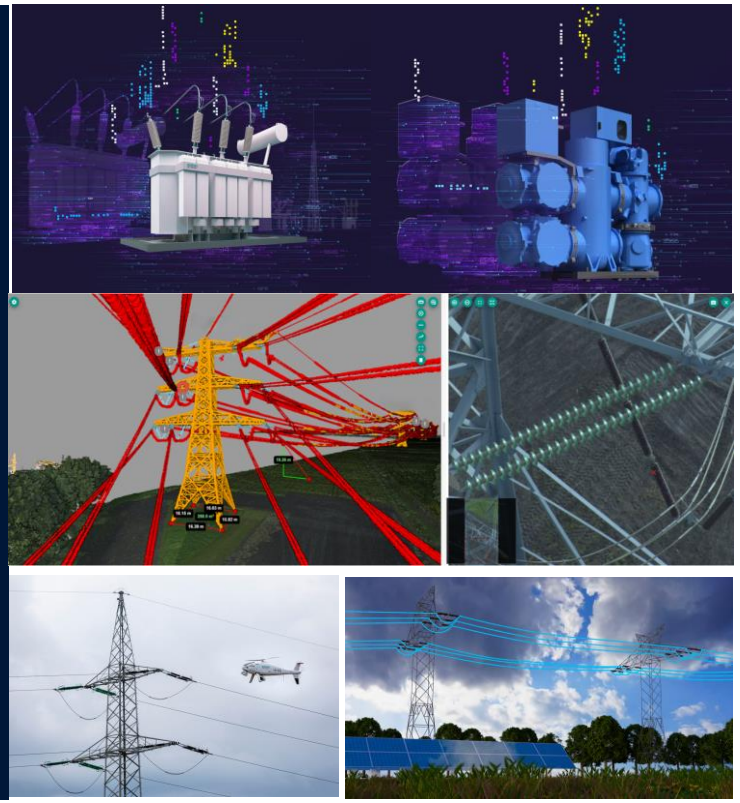
Interoperability: Multi-vendor merging units, IEDs, and SCADA integration

Centralised control and protection functions

Benefits: remote operations, easy upgrades, vendor flexibility

Asset digitalisation & GETs

- AI-based digital twins for transformers and switchgear
- Real-time grid state estimation, dynamic line rating, and predictive maintenance
- Fleet-wide intelligence and situational awareness



Standardisation

- IEC 61850 and IEEE 1588 as foundational protocols
- Interoperability across multi-vendor environments
- Modular, vendor-agnostic design for scalability and replication

From sensing to orchestration: a unified stack to enable adaptive operations

Current portfolio

Upcoming portfolio

Shifting to an adaptive approach requires an interconnected, data-driven technology stack that spans the entire grid:

Sensing	Data flow and operations	Simulation	Inference and forecasting	Orchestration
Real-time data on asset usage, demand, and generation	Seamless, cybersecure movement of data	Digital twins and scenario modeling for grid needs & risks	AI/ML for prediction, expert-led analysis, risk scoring & support	Coordination across grid actors to enable adaptive decisions

Overhead line digitalization		Trafo & Switchgear digitalisation	Cybersecurity offerings	Digital twins of s/s assets	Expert consultants	AI-lab for advanced apps	Data unification & orchestration
							
• 3D mapping of OHL assets	• OHL sensors for dynamic line rating	• Condition monitoring of s/s assets	• Cyber-physical security of s/s assets	• OEM-enhanced twins	• Tech and tech-econ decision support	• Partnerships & investments for use of AI in grids	• Event-driven, (near) real-time orchestration

Siemens Energy's Digital Grid can deliver the full capability stack — from sensing to orchestration — unified under one roof to enable truly adaptive operations

Together, we energize society

Thank you!

Stay in contact with us:

Siemens Energy | Digital Grid

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