Siemens ENEAS solutions for substation automation and protection

System solutions for energy automation

Answers for energy.

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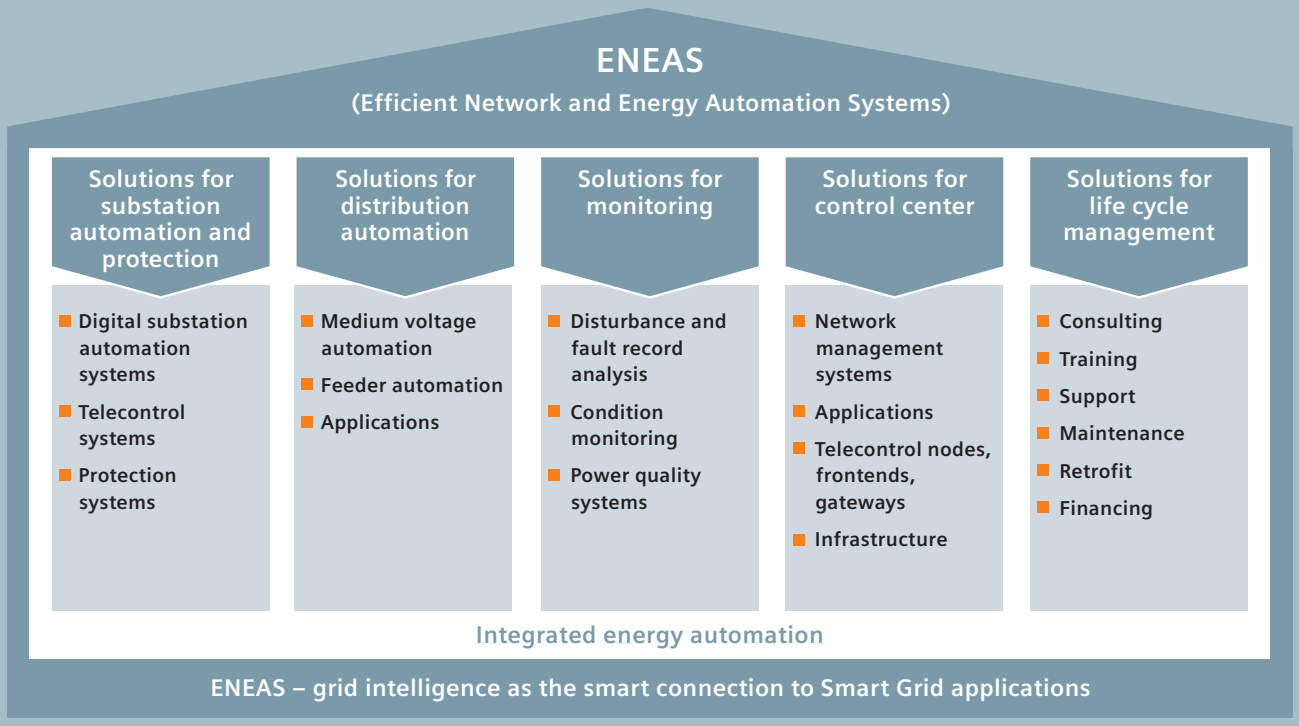
An integrated approach for the entire spectrum of energy automation

New challenges and dynamic market developments

Today, network operators and energy suppliers are confronted with steadily mounting challenges. Through energy efficiency and emission reduction requirements, legislators and regulatory agencies are exerting more and more influence on operating parameters. In addition, intelligent networks are emerging that require entirely new approaches to energy automation. The burgeoning number of distributed renewable energy generators is causing a bidirectional load flow and, in the foreseeable future, demand response will replace load-oriented power generation. But intelligent applications can be used to full advantage only if standardized communication and interfaces are in place. The use of networks and TCP/IP is making IT security a priority topic as well. With appropriate solutions, these challenges can be transformed into opportunities and competitive advantages. And that is exactly the goal driving the development of ENEAS solutions from Siemens.



Siemens ENEAS solutions manage all aspects of energy automation with efficient project planning, reliable safety functions, unlimited communication, and compatibility with international standards. They create a solid foundation for intelligent transmission and distribution networks.

Always one step ahead with ENEAS solutions from Siemens

Comprehensive and efficient overall solutions for all areas of energy automation based on time-tested Siemens products – this is the idea behind Siemens ENEAS (Efficient Network and Energy Automation Systems). This integrated concept offers compelling benefits in all areas:

- efficiency thanks to low costs throughout the entire life cycle
- sustainability through extensive performance reserves and open interfaces
- an ideal technical basis for the intelligent grids of the future
- the high level of safety only a demonstrably dependable business partner can guarantee.

Ready for Smart Grids with ENEAS

ENEAS solutions are an important element in the establishment of intelligent electricity networks with automated functions, distributed applications, and interlinked communication for the monitoring and optimization of network components. These intelligent networks meet societal and regulatory demands for high-efficiency, environmentally sustainable network infrastructures. They also allow the optimization of work processes, enable more efficient operation management, and ensure a higher degree of supply security.

Use synergies and save costs

System solutions for substation automation technology and telecontrol systems form the basis for automation, metering, and power quality. They make it possible for plant operators to benefit from many synergistic effects when it comes to both investment and operation.

They are especially effective in conjunction with other ENEAS solutions. The resulting synergies save time and costs, for example when creating communication links among distributed components. Consistent workflow and ongoing data exchange across all areas of energy and network automation create a solid foundation for intelligent networks, and are also the keys to ensuring reliable, economical operation of transmission and distribution networks in an increasingly competitive market.

ENEAS solutions provide the highest level of substation automation and protection

Intelligent substation automation on a consistent basis

Siemens ENEAS solutions for substation automation and protection incorporate a complete range of proven concepts for all substation automation tasks at all voltage levels and for all types of substations:

- Decentral substation automation based on distributed bay units
- Compact systems for ring main units and pole-mounted switches, for efficient network monitoring, trouble-shooting, and fault correction
- Central telecontrol systems with integrated automation and node functions
- Multifunctional protection systems for the coordination and interaction of different protection devices

Knowledge as a factor of success

The most important factor in successful substation automation and network operation improvement is the rapid availability of the right information. As the market leader in energy automation, Siemens is spearheading the development. The Siemens specialists have hands-on experience with the world's largest installed base, and play a major part in driving technological development. Siemens' leading role in the development and implementation of the IEC 61850 communication standard is just one of many recent examples.

Your benefits

- Proven concepts and a consistent, end-to-end basis for all substation automation tasks
- The knowledge and experience of over 70 years of market leadership in substation automation
- Customized solutions for all voltage levels and all types of substations

An example of technology leadership in action: IEC 61850

Siemens was the world's first company to commit to full implementation of the IEC 61850 standard. The object-oriented structure of this standard includes protection and control, and it makes the operational management of substations significantly more efficient. IEC 61850 supports the interoperability and integration capability of substation automation systems, facilitates vendor-independent substation engineering, and reduces planning effort at the same time. The first plant using this standard commenced operation in 2004, and since that time over 2,000 IEC 61850-compliant systems with over 120,000 devices have gone into operation.

Experience and technology leadership

Today, Siemens is one of the world's leading companies in energy automation – due in no small measure to the company's extraordinarily long practical experience in this field. Siemens has been working in protection technology for over 100 years, and for some 70 years in substation automation and telecontrol technology.

Siemens has repeatedly set new benchmarks in energy automation. The introduction of the analog protection relay in 1957, or the first digital substation automation system in 1987, are just two striking examples.

Today, over 5,000 Siemens digital substation automation systems are in operation around the world, along with over 100,000 telecontrol systems and over a million digital protection devices.

How can efficiency and future-proofness in digital substation automation technology be combined?

Digital substation automation systems

Efficient, reliable, and open to new developments

The integrated concept of the ENEAS solutions covers the entire spectrum of substation automation. It can be adapted to any existing infrastructure, and special configurations can be developed for individual customer requirements. In addition, for many of the most widespread applications Siemens offers generic solutions that are preconfigured and, therefore, especially economical. The extensive range of available applications allows intelligent, environmentally sustainable, reliable, and highly economical network operation.

ENEAS solutions provide efficient, reliable digital substation automation technology everywhere – in transmission and distribution networks as well as municipal utilities, combined systems, and industry.

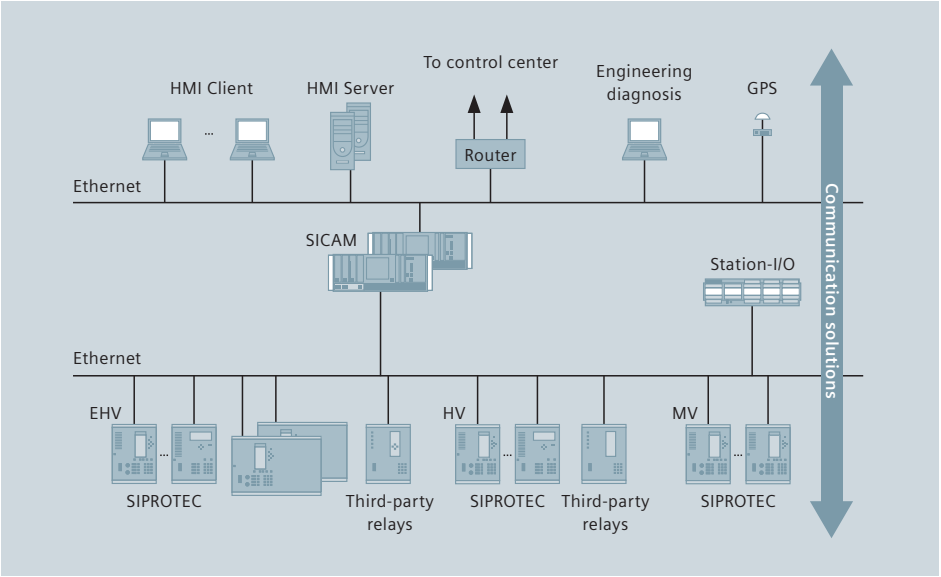
The digital automation of substations is based on distributed devices, and it provides a wide range of functions for data acquisition, control, and monitoring as well as for protection and communication. ENEAS solutions are composed of Siemens components and products that from the start are coordinated to work together perfectly – especially the devices in the SIPROTEC, SICAM, and SIMEAS product families. Third-party components that may be needed are qualified in system testing.

Minimum life cycle costs through open architecture

Your benefits

- Fast, accurate system engineering through consistent object orientation, with unique data point entry
- Outstanding system performance through flexible characteristics, minimum failures, and redundant architecture
- Support for intelligent networks through compliance with the IEC 61850 communications standard, intelligent applications, and extensive cyber security functions

Substations in transmission networks



What synergies can be exploited in distribution networks?

Distribution automation

True value added through integration

ENEAS solutions for distribution automation manage the automation of distribution network substations and ring main units. Their integrative concept ensures seamless adaptation to existing infrastructures and applications for distribution network operators.

ENEAS supports the intelligent, environmentally compatible, reliable, and efficient operation of distribution networks. Most importantly, ENEAS solutions already meet the requirements of future Smart Grid operation, ensuring sustainability and viability into the future.

The automation of distribution networks is based on a modular system that can perform all automation tasks required in a distribution network. This helps increase the reliability of medium-voltage networks, reduce failures, and effectively shorten the time needed to eliminate faults.

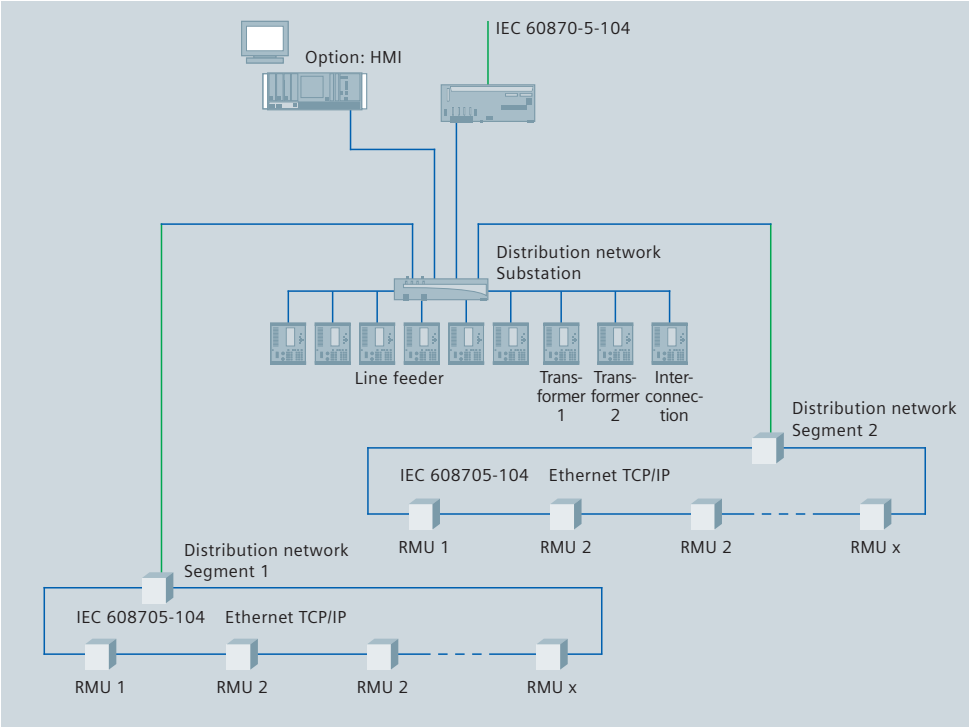
ENEAS solutions for distribution automation are ideally suited for the "classical" functions of monitoring, controlling, and automating networks, for supplying the necessary data communication, and for future functions in Smart Grids. Power quality measurement, condition monitoring, and fraud detection are all accomplished by system technology that is uniform at all levels. Data nodes and intelligent voltage controls are implemented for this purpose.

Quantifiable benefits through the seamless interaction of all distribution automation applications

Your benefits

- Consistent automation and communication system solutions from a single source
- Synergies throughout – from end user to control room – in metering, automation, supply quality, and distributed generation
- Intelligent terminal blocks provide scalability, efficiency, and economy

Typical distribution automation configuration



Which tasks do telecontrol systems perform today, and which ones will they perform in the future?

Telecontrol systems

Much more than classic telecontrol

Telecontrol systems designed as ENEAS solutions provide multi-hierarchical monitoring and remote control as well as automation functions at all levels. The modular system can be adapted to any primary processes and their spatial distribution. System solutions are available for both energy transmission and distribution to optimally perform telecontrol tasks for all aspects of data acquisition and process interfacing, communication, data concentration, and automation.

From small substations using terminal block technology to large telecontrol stations with high signal density and numerous interfaces, ENEAS covers the entire spectrum. Its modular structure ensures long-term expandability. All components are based on a shared system architecture and technology so that entire systems can be parameterized with a common tool throughout all project phases. Data point entry on individual devices is a thing of the past, and multiple entries are effectively prevented, even in mixed systems.

All components deployed in ENEAS telecontrol systems utilize the same communication functions, so that the available protocols are usable in all telecontrol components.

Intelligent telecontrol technology, adapted to many applications

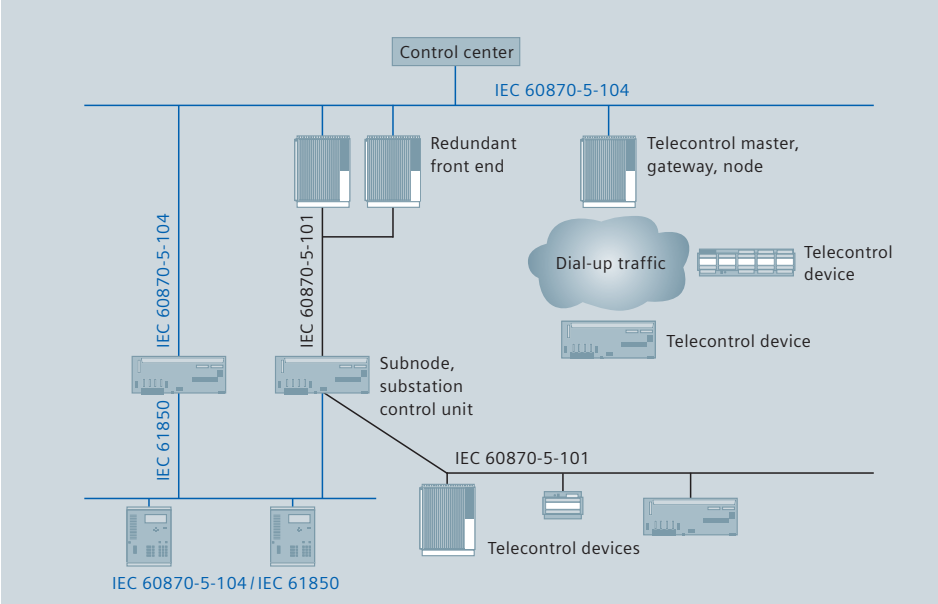
Your benefits

- Simple integration into existing systems through flexible protocols and upgrades
- Long life cycle thanks to evolutionary development and effective migration concepts
- Modular, multi-hierarchy systems based on a shared, scalable system family for all applications

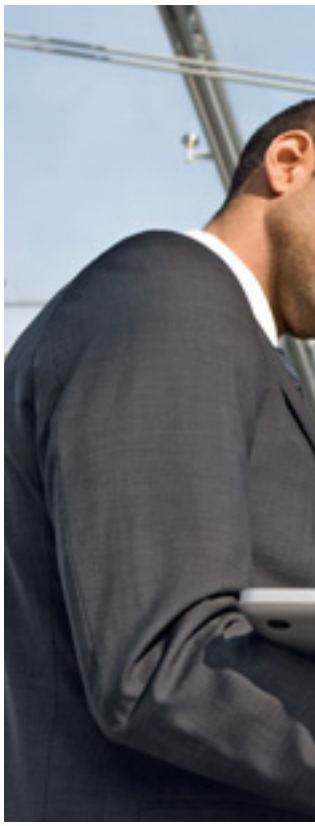
Along with the IEC 60870-5 series and IEC 61850 standard protocols, DNP 3.0 and Modbus are also available for all applications. In addition to these standards, numerous proprietary protocols for components by other manufacturers are also supported.

The modular concept, distributed architecture, and evolutionary development principle ensure that these systems have long life expectancy and are open for future developments, thus providing a high degree of investment safety and enabling the creation of Smart Grids.

Typical multi-hierarchy telecontrol system



How will new network structures influence protection concepts?



Protection systems

Reliable, efficient, adaptable substation protection

Protection systems are crucial for high- and medium-voltage power supply operations. They must react to faults in milliseconds in order to prevent damage to costly equipment such as switchgear, transformers, and cables, ensure a high level of safety, and avoid failures of supply.

ENEAS solutions for protection systems ensure a reliable, efficient power supply. They are designed to allow selective procedures for different network structures and changes in operational processes, and they provide much more than just the dependable fulfillment of the basic functions of protection, control, and monitoring.

ENEAS solutions incorporate innovative approaches such as harmonized interfaces and interoperability, multi-layered safety mechanisms, and efficient engineering. Intelligent functions form one of the key prerequisites for Smart Grids.

Reliable equipment protection through consistent system solutions

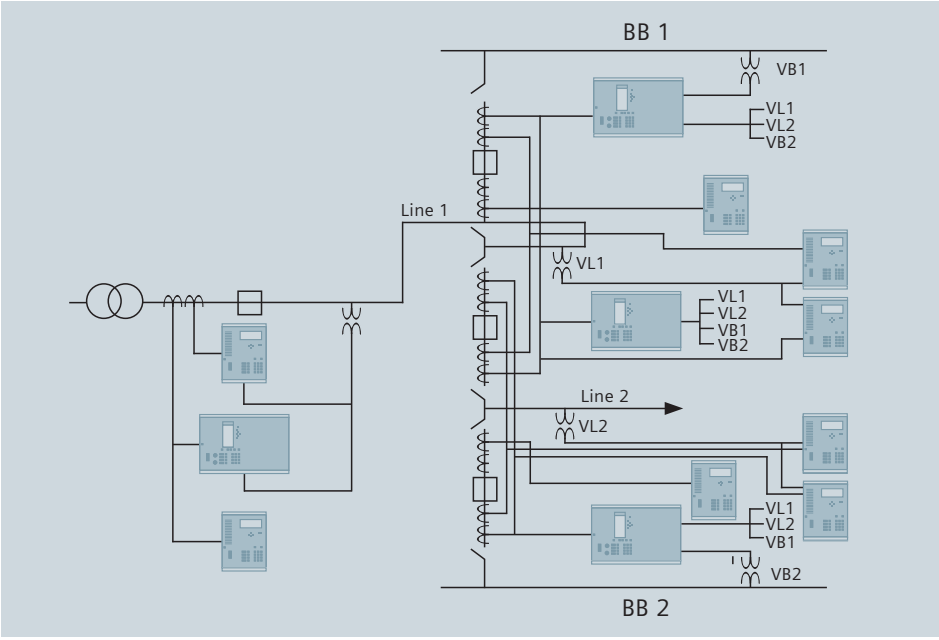
Your benefits

- System solutions based on Siemens products of long-term, proven effectiveness
- Many variations possible through breadth and depth of the product spectrum
- Experience, knowledge, and practical expertise from the world's largest installed base
- Individually configurable devices for cost-effective system solutions that are a perfect fit

ENEAS protection systems support network operation during fault tracking or power quality analysis, adding useful features to the proven benefits of older protection systems.

ENEAS solutions for protection systems allow individual protection devices to work together perfectly using the powerful communication technologies available today. Examples are, among others, the complex protection requirements of 1.5 CB schemes or automatic load shedding between power plants in industrial networks.

Example of a protection system for a 1.5 CB scheme



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