ABB substation automation and protection for greater profitability.
The total proposition
Panorama is the standard for a comprehensive range of integrated solutions for efficient and reliable management of power networks. Using innovative information technology, Panorama delivers total control of the power process, from generation to consumption. The Panorama standard covers six application areas, each offering specific solutions.

Station Automation & Protection
Station Automation and Protection includes control, monitoring, and protection for power plant, transmission, and distribution applications. Solutions range from single function protection and control units to fully integrated, comprehensive, high-performance substation automation systems.

Network Management
Network Management enhances operation of interconnected power networks. It provides integrated solutions that optimize energy supply while maximizing reliability on both transmission and distribution networks.

Business Management
Business Management provides the tools and solutions to help energy companies grow profitably in today's changing market place. Systems for wholesale and retail energy supply and transportation provide the foundation for success in the competitive environment.

Meter & Load Management
Meter and Load Management comprises electricity metering products and integrated systems for automatic meter reading, and load management.

Consulting & Services
Our comprehensive range of consulting and other services includes pre-studies and situation analysis, technical specifications and advice, feasibility studies, training, installation, commissioning, maintenance, repair and help line.

Communications
Communications offers solutions for all communication requirements in the transmission and distribution networks of power utilities and industries.
ABB serves customers in power generation, transmission, distribution and numerous other areas. Electrical engineering expertise built up over more than hundred years has enabled us to develop optimized systems, products, and services for the management, automation, control, and protection of power networks.

We have developed the Panorama concept in order to address all aspects for cost-effective power supply and associated services. Panorama ensures all our systems, products and services for network management, automation, control, and protection can be fully integrated.

Competitiveness for our customers
We undertake everything to secure that our customers stay ahead of the competition. With custom-made automation solutions, we improve their efficiency, strengthen their position for the liberalized market and maximize their profit. The recipe for success is customized automation, using the latest information technology to closely model the entire power process. This enables operating costs to be optimized and maintains the value of our customer’s assets.

Solutions for substation automation and protection
ABB’s Panorama offers products and systems for substation automation and protection applications in power plant – and transmission – and distribution substations. Typical solutions include systems for substation automation, i.e. control, monitoring and protection, as well as protection products and systems, and remote terminal units for traditional SCADA configurations.

Communications are the backbone of any automation system, and ABB products support most standard communication protocols. Our substation automation systems exchange data at the substation level and communicate with the network control center, remote workstations for protection engineering and maintenance, and with office and business systems. And, with the latest advances in process bus technology, communication can now be extended all the way into the primary equipment.

ABB is your natural partner
Whatever the size of the project, ABB has the resources to support power companies in developing their power business. Our engineers have the experience, skill, and know-how to create world-class solutions for both new and retrofit projects.

We offer everything from single function products, to complete substation automation systems with integrated protection, control, and communications, for both standard and complex substations. We supply systems and products to IEC and ANSI standards.
We deliver exactly the solution you need.

Transfer resources to benefits

Power networks at transmission and distribution level need to be retrofitted and expanded as infrastructures grow and new industrial, commercial, and residential projects are implemented.

The deregulation and globalization in the power industry generates pressure to improve the business efficiency of power system operation, maintenance and life-cycle asset management. The challenge for the power company is to drive their plants and systems harder, while maintaining the quality of supply and providing the best service for their customers at competitive prices.

Upgrading existing networks by implementing modern substation automation concepts complemented by efficient corporate information systems is the right approach to exploit the new market opportunities. Upgraded systems satisfy new requirements for high quality electricity supply in an increasingly competitive marketplace.

Our power process know-how enables us to offer the best solution to help achieve a safe ongoing development. We deliver products and we engineer, test, install and commission high, medium, and low voltage protection and control systems for power companies and industry.

Automation solutions for high and medium voltage substations

A typical ABB substation automation system for high or medium voltage includes substation control, communication gateways, an inter-bay bus, bay control and protection. A total solution would be a system providing all protection, control, monitoring, and local and remote communication functions. At station level, it would also include independent operator workstations and remote control gateways. At process level, it would include a process bus option for remote I/Os and advanced sensors and actuators.

The communication gateway carries the information exchange with the network control center. The interbay bus conducts the data exchange between station and bay levels and between bays. Bay level units communicate with the process and perform control, protection, monitoring, and communication functions at the process level. Protection and control units can be mounted in cubicles or integrated directly into the switchgear, thus saving engineering, space, and wiring.

Microprocessors enable several protection and control functions to be combined into one intelligent terminal, while maintaining with the autonomy of bay level functions and devices. Self-
supervision on all levels of all functions increases not only reliability and availability, but also enables the maintenance of both primary and secondary equipment to stage down to maintenance on demand.

**Moving intelligence closer to the process**
The most recent developments in advanced sensor, actuator and process bus technology have started to replace the conventional current and voltage transformers, drive mechanisms, status indicators, and most of the electrical wiring at least for new substations with advanced switchgear.

Moving the intelligence into the high voltage equipment creates a system in which processing units at station, bay and primary process levels monitor the vital parts of the substation as close to the process as possible.

**Automation systems for medium and low voltage networks**
We supply the optimum feeder automation solutions for medium voltage networks, covering secondary substations, ring main units, disconnectors and auto-reclosers. In medium and low voltage industrial networks, connections to motor control centers are also supported.

Our units are designed for remote and local control, condition monitoring and the automation of disconnectors, switches, and other equipment on overhead lines and cable networks.
Bringing station control and protection together.

To operate safely and reliably, modern power systems require dependable, accurate and timely information from the primary equipment. Power network control systems are dependent on data from the substations. The safety of the power network also relies on the protection in the substation. In the substation, the same data are used to automate various processes in a distributed process oriented configuration which reduces the space, engineering, and wiring requirement.

Greater customer satisfaction and higher revenues

Today’s substation automation solutions are a cost-effective means of replacing conventional technology in basic functions like control, protection and monitoring. These solutions, including substation communication and information functions, are increasingly becoming a standard application in electricity networks.

The advent of information technology, IT, has accelerated the expansion of monitoring and supervision, automated control, communication, and adaptive protection in the power process. IT also provides fast access to accurate, reliable and comprehensive network data.

The most important benefits of substation automation to the power company are greater availability and better utilization of existing network capacity. These are achieved by:

- faster fault detection
- faster, more reliable corrective action
- fewer outages
- faster power restoration
- optimized network efficiency
- improved quality of supply.

The result is a better service and greater customer satisfaction. Shorter downtimes and faster restoration of supply increase revenues. In other words, substation automation significantly boosts profitability, power network reliability, availability, and efficiency and safeguards power company assets.

Protection and control for a bay are mounted together in one cubicle, both functions may also be provided by one single device only. Unseen but equally important is the data exchange between both function groups allowing adaptive protection, providing consistent data for asset management, etc.

Substations both in transmission and distribution networks benefit from increased automation. Reliability and fast restoration are two important benefits of an automated solution.
Key components for every solution.

Substation automation systems for control, protection and monitoring are basically similar in structure, because they reflect the structure of the substation. ABB offers a comprehensive range of hardware and software products for such systems, which can be purchased individually or as part of a system. Typical features of our products are flexibility, scalability, and communication.

Intelligent bay terminals
Basic functions
The ABB range of intelligent microprocessor based terminals covers all protection, control, monitoring, and communication functions at bay and station levels. All our terminals feature state-of-the-art numerical technology, compatible with substation primary equipment and conventional secondary technology. They can be programmed and tested either at our works or on site, thus shortening commissioning time. An HMI and PC interface and the supporting software offer easy access to terminal data during commissioning, operation, and maintenance. Most of our terminals can be supplied with disturbance and event recording, programmable logic and breaker-related functions. They can be configured with a different number of binary inputs and programmable outputs, which can be used to control switchgear and other primary equipment. Depending on the requirements of the application, these terminals can be very complex or have just a single function.

Protection terminals
There are intelligent protection terminals for:
- Generators
- Lines
- Feeders
- Transformers
- Breakers
- Busbars

Control terminals
In HV and EHV substations, the intelligent control terminals at bay level control and supervise circuit-breakers, disconnectors, and earthing switches. They operate with any type of switchgear and busbar arrangement.

Standard pre-tested functions for controlling high voltage apparatus, interlocking, synchron-check, and auto-reclosing, are examples of functions that can be implemented in a single terminal without detriment to the availability of the complete system.

Combined terminals
In distribution substations, both control and protection functions are integrated in the same feeder terminal. Combined terminals of this kind are usually mounted directly in the switchgear cubicles instead of on conventional control and protection panels. Combining protection and control in the same terminal is the trend for transmission substations as well.

Remote and advanced process interfaces
In many cases, it is advantageous to extend the process interface beyond the hardwired I/Os in the bay terminals and other devices. The copper cables are then replaced by a process bus connected to remote I/Os installed in the switchgear itself. A process bus also permits advanced sensors and actuators, which at least in advanced
switchgear are replacing conventional current and voltage transformers, drive mechanisms, status indicators, and most of the electrical wiring.

**Remote terminal units**
For conventional SCADA applications and as a preparatory step to substation automation, our remote terminal units support local I/O, remote I/O and communication with protection terminals. They perform process data acquisition, time tagging and measurement functions, and support programmable logic control functions. International standard communication and other widely used protocols are also supported.

**Station level units and HMI**
Our monitoring and control system offers the following main features:
- Windows NT PC-based user interface for interaction with the protection functions, control system and the process
- Automatic supervision and control
- Alarm and event handling
- Data acquisition from protection, control, RTUs, PLCs and meters
- Trend forecasting and reporting
- Communication for remote control, protection and substation monitoring.

The graphic operator workstation supports functions such as control and supervision of primary equipment, presentation of single-line diagrams circuit-breaker positions, busbar colouring, object tagging, alarm and event reports, and presentation and reporting of measurements. It also supports the display and setting of protection parameters, adaptive protection by changing parameter sets, disturbance recorder evaluation, and fault locating.

Other functions include bay and station interlocking, automatic switching sequences, storage of events, disturbance recorder reports, storage of measurements and time synchronization.

Monitoring, control and communications, functions can be realized in a compact solution with a single PC, or in a distributed architecture comprising systems and communication servers. System engineering is supported by a software library of functions and displays and by tools for database, signal, and communication engineering.
Our project managers say, “To us, project management and system implementation is the key to ensuring the successful realization of a solution. ABB’s global presence generates many different projects in different parts of the world under different conditions. This gives us a wealth of experience, which we can draw on when engineering new solutions. We are convinced that on-going interaction between ABB and the customer’s engineers is essential in any project. And by combining our products and tools with the experience gained from successful projects and the system integration expertise built up over many years, we are confident we can deliver added value for our customers.

We believe an open architecture is important to communicate with other systems and products. This is essential for systems integration. First and foremost, we want to be proud of what we deliver.”

**World class project management**

**Project stages**
Substation automation projects are implemented in specific stages, each of which has to take many aspects into consideration. It takes more
than optimized hardware and software to complete a project successfully. World-class project management, system integration know-how, and intimate knowledge of the complete power process are just as important.

**Project engineering tool**
We have developed a dedicated set of project engineering tools to optimize the engineering process and ensure quality to ISO 9001 standard. It covers all phases of a project from the specification to commissioning, support and maintenance, and future system modifications. The tool also supports the integration of numerous products in a common engineering and system environment.

**Design and engineering**
Before project management proper gets under way with the customer’s specifications we have to make sure we understand his requirements and enable us to prepare an appropriate offer. Once an order is received, the first step in engineering substation automation solutions is to enter the project data such as signal specifications, substation single-line diagram, system architecture, and system functions into the tool in accordance with the specification.

State-of-the-art-system design must also include safety aspects and performance needs. Signal routing has to be designed for safe and reliable system operation under all operating conditions. In addition to the software, signal, and hardware engineering, the relationship between the system components and the connections to cubicles and associated products and functions is documented in wiring and cable lists.

- Data consistency throughout the engineering process is crucial to system quality. Data is therefore entered only once and is then available to all others working on the project.
- After finalizing the design, configuration files are generated for downloading to the system modules, and the associated documentation is created.

**Testing**
During the works testing culminating in the factory acceptance test (FAT), we simulate the substation process and check the function of each data point, simulate critical situations, monitor response times and check that there are no data collisions. We make sure that the system operates as specified, and that hardware and software quality and performance are an optimum. This is confirmed after commissioning by the site acceptance test (SAT).

**ABB will support you and your business**
Electricity is generated and distributed in the more than 140 countries around the world where ABB is present. With the installed base of thousands of products and systems ABB has gained extensive know-how and occupies a leading position in the substation automation and protection field.

- In both our local center near you and our global centers responsible for products and systems, we are always ready to advise our customers, supply the best products and systems to do the job and maintain what we delivered afterwards. We offer all the service you need to be successful in your business. Backed by our global capabilities and technology, we can operate efficiently using local expertise based on common standards, synergies, and economies of scale.
Panorama is a complete range of integrated solutions for the efficient and reliable management of power networks. Using innovative information technology, Panorama delivers total control of the power process, from generation to consumption.