



ABB North America

Power Systems Automation and Communication

Protection and control for reliable and
optimized power delivery

Reliably bringing power to the people

For more than 100 years



ABB is a leader in power and automation technologies that enable utility and industry customers to improve their performance while lowering environmental impact.

Today, the ABB Group of companies employs more than 145,000 people in some 100 countries, and has annual revenues of about \$40 billion. Globally, ABB is headquartered in Zurich, Switzerland, with North American operations headquartered in Cary, North Carolina. ABB employs about 30,000 people in multiple manufacturing, service and other major facilities throughout North America.

The history of ABB spans 130 years and is built on the foundation of ASEA (Sweden), BBC (Switzerland), Westinghouse (U.S.) and several other heritage brands. Westinghouse Electric Corporation was founded in 1886 by George Westinghouse, the visionary who devised the use of alternating current (AC) for electric power transmission and distribution. In 1989, ABB acquired the T&D business of Westinghouse, giving ABB a leading position in North America. ABB has been, and continues to be, a driver of the electrification of the world, fully supporting our vast installed base of new and legacy products from transformers and breakers to electro-mechanical relays and FT switches. With brownfield upgrades and greenfield installations, we ensure the security of investments in more complex systems like supervisory control and data acquisition (SCADA), flexible AC transmission systems (FACTS) and high voltage direct

current (HVDC). Our North American experience and resources are the bedrock for our full support of products and systems independent of application and age. It ensures the power system know how to design protection, control and automation solutions for reliable and optimized power delivery.

Our way forward

ABB is the world's largest manufacturer of power transmission and distribution equipment, offering a wide range of advanced products and solutions to enhance grid reliability and support the systems that keep our world running. Our portfolio not only includes our well known state-of-the-art power transformers, circuit breakers, HVDC, FACTS, network management, substation automation and protection solutions, but we are also a major supplier of generators, converters and grid integration services to wind and solar power plants. ABB's expertise in power transmission systems and electrical optimization, grid reliability and blackout prevention offers sustainable solutions to the challenges of today, and tomorrow.

Our success has been driven particularly by a strong focus on research and development to meet customer needs both globally and locally, especially within power T&D applications. We maintain seven corporate research centers around the world, including our North American research center located in Raleigh, North Carolina. The result of this significant R&D investment is a long and storied record of innovation including FACTS and HVDC, both introduced by ABB U.S. for the Pacific Intertie more than 40 years ago.

Innovation continues to modernize the electric grid. The development of information and communication technology (ICT) has transformed our world in many ways and these transformative technologies are now enabling power system design and operations to meet new challenges. ABB is a global leader in this evolution. With intelligent protection, control, communication and automation products and systems, we deliver a future-ready digital substation – supporting the evolving smart grid.

The Digital Substation: Simplicity, savings and safety

Applying our unique Relion® technology and open communication standards, we offer efficient and reliable substation automation, protection and control solutions ready for the future, today. This enables migration to the digital substation, delivering smaller foot print, less wiring, increased personnel safety and improved reliability, resulting in reduced cost of ownership. You can be confident that our experience and domain expertise makes ABB a reliable and trusted partner for all major parts and systems of your evolving grid.

The future is now Are you ready?

The demand for reliable electricity is increasing and the integration of variable renewable energy sources is an imperative. These forces combine to impose new stresses and requirements on an aging T&D infrastructure. Further, the restructuring of the electricity market and increased customer involvement will continue to change the electric utility industry.

To satisfy both the increasing demand for power and the need to reduce carbon dioxide emissions, the electric system needs to manage these challenges in a sustainable, reliable and economical way. This requires even more intelligent solutions to design and operate the power system, generally referred to as the “smart grid”.

Designed to meet the four imperatives for our global society’s electrical systems: capacity, reliability, efficiency and sustainability, ABB believes the smart grid is the future. With our state-of-the-art technology, services and systems, applied in cooperation with customers, we offer an efficient and secure migration path from the past into the future - the Digital Substation.

The information imperative

ABB has deep experience in substation communication networks and architectures using DNP 3.0, IEC 60870 and other protocols. Our products and systems continue to fully support DNP 3.0. However, the information required for real-time decision making, efficient power system management and enterprise-wide data integration mandates the state-of-the-art communication of this information from the local automation system, between substations, to network control centers and other users.

IEC 61850 is the foundation for open communication and information exchange in the Digital Substation. The IEC 61850 standard for communication in substations is one of the most significant developments in substation automation and protection technology for the past several decades.

An open substation automation standard

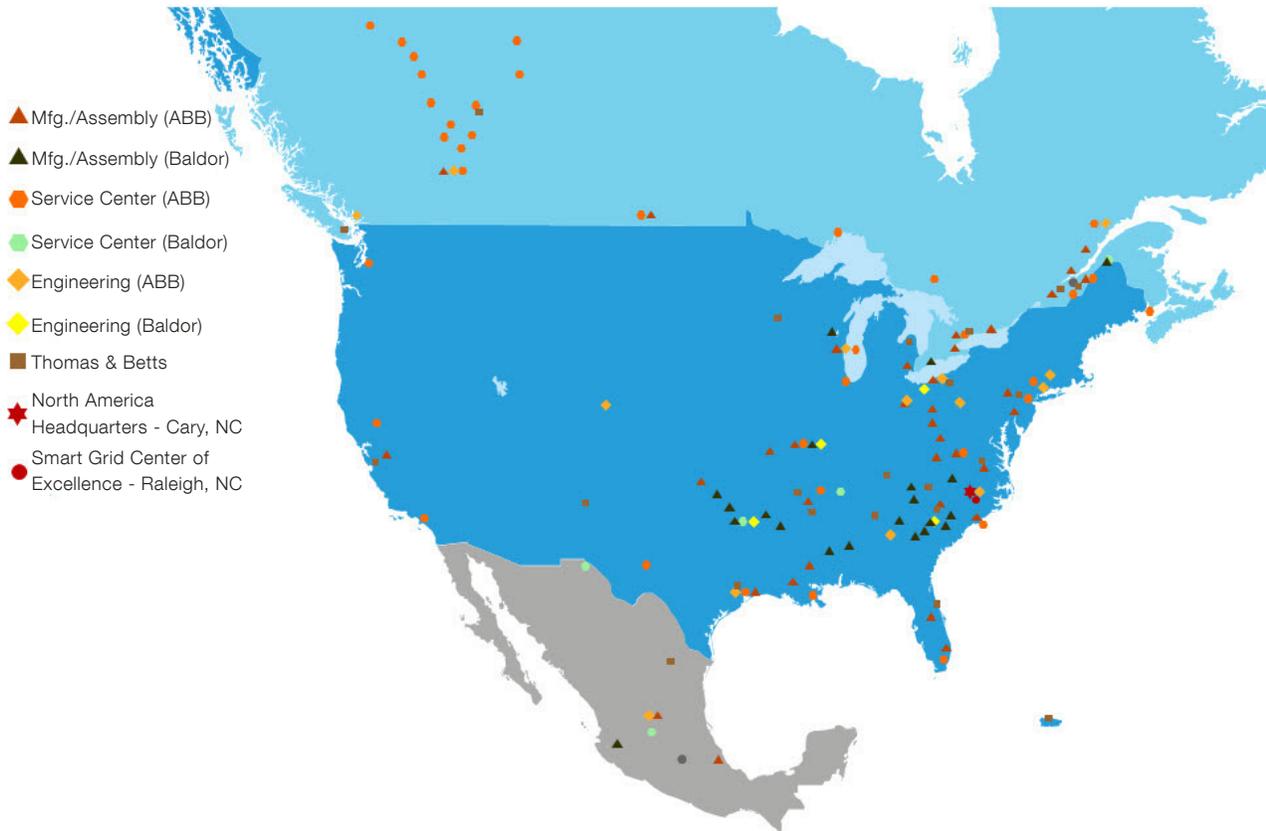
The IEC 61850 standard fulfills a long-standing requirement for a single global standard for interoperability and real-time communication and data exchange between critical substation automation devices. IEC 61850 is the foundation for open communication and information exchange for the “Digital Substation” supporting what we call the smart grid.

ABB has been a driving force in the development of the IEC 61850 communication standard for substations and is the world’s leading supplier of IEC 61850 substation automation products and systems with more than 1000 systems in operation for T&D grids in more than 60 countries.



ABB North America

Our presence



In 2012, ABB North America had revenues of \$6.7 billion and the workforce grew to nearly 20,000 employees. The total workforce in North America is now about 30,000 in close to 100 manufacturing, assembling and service facilities serving our North American customers and also exporting globally. This includes several transformer, switchgear and breaker manufacturing plants.

During recent years ABB has made large investments in North America including the acquisition and integration of Ventyx, Baldor, Thomas & Betts, Tropos and Power-One. This has added important technology and know-how for SCADA, energy management systems (EMS), distribution management systems (DMS), wireless communication and integration of PV solar energy – all essential smart grid technologies. In addition ABB recently opened a large cable factory in Huntersville, NC. Built on our Westinghouse heritage, our unique system know-how and our global leadership, ABB is committed to be your major technology supplier for protection, control and automation of T&D applications in North America.

Power system protection, control, automation and communication

At our facility on the Centennial Campus of North Carolina State University, ABB maintains its North American headquarters for the Power Products and Power Systems divisions, as well as the Power Systems corporate research & development center and the Asset Health Center.

ABB's Power System Automation and Communication business and Smart Grid Center of Excellence are also located on the Centennial Campus, creating an ABB power T&D hub for North America. This includes the engineering and support center for substation automation with Relion® transmission and generation protection, as well as engineered Substation Automation Systems and communications.

Relion protection and control for distribution and industry applications, as well as electro-mechanical and legacy relays are supported out of Coral Springs, FL. Additionally, substation automation, protection and control solutions are supported from regional support centers throughout North America as well as by the ABB network of regional sales and technical managers.

ABB North America

Our experience

From the first Westinghouse transformer and protective relay installations to the invention of HVDC, FACTS, ultra high speed protection and SCADA, ABB has been a major contributor to the development and innovations of the North American electric grid.

Evolutionary T&D technologies

ABB pioneered HVDC technology almost 60 years ago and remains the world leader with over 70 HVDC systems around the world, including more than 20 in North America. ABB innovated the application of power transistors in HVDC and static var compensation (SVC) and has a large installed base in service since 1999.

ABB also developed what we now call Flexible Alternating Current Transmission (FACTS) with the introduction of series compensation on a 400 kV line in Sweden and on a 230 kV BPA transmission line in the U.S. more than 60 years ago. Today ABB is a global leader in the growing field of FACTS with some 700 installations in operation or under construction across the world. PEPCO, AEP, HQ, Oncor, CFE, Hydro One, Altalink, Alberta Power, Manitoba Hydro, BC Hydro, PG&E, Duke Power and BPA are among our North American customers.

The delivery of series compensation started in the 1950's and there have been more than 100 series capacitor projects supplied to North American customers for applications between 345 kV and 735 kV. The delivery of SVC started in the 1970's and more than 100 projects have been installed in North America up to 735 kV.

We enjoy the most extensive reference list for advanced control centers with more than 400 installations delivered globally in the last decade, of which more than 100 are in North America.

Revolutionary projects

Pacific AC and DC Intertie: The challenge of bringing hydro power from the Northwest to California required two new technologies developed by ABB - HVDC and FACTS. The first of a total of 13 series compensation banks for 500 kV HVDC and the first HVDC line were contracted in 1965. Since then, the Pacific Intertie has undergone major expansions and re-buildings. The latest upgrade will be put in service in 2016 with a capacity of 3,800 MW for the nearly 850 mile long connection.

Interconnecting Texas and Mexico: The 150 MW back-to-back HVDC converter station will be built in Mission, Texas where an identical installation was delivered by ABB in 2007. The two stations will work in parallel, significantly increasing the power transfer capacity between Texas and Mexico.

Smart substations in Mexico: ABB has delivered many solutions for CFE in Mexico such as turnkey 400 kV substations, SVC and 400 kV series compensation.

Integrating wind power in Texas: To enhance the stability of Oncor's HV network, ABB delivered an award-winning project; a large cluster of SVCs. The SVCs enable more power to flow through existing networks, enhancing capacity and supporting the integration of large-scale renewable energy sources.

An energy bridge to Long Island: Cross Sound Cable is a 25 mile 330 MW HVDC Light® underwater cable link between Connecticut and Long Island, New York. The system is made up of high-tech extruded (oil-free) cables buried under the seabed. The link improves the reliability of power supply in the Connecticut and New England power grids, while providing urgently needed electricity to Long Island.

The HVDC Transmission Québec - New England: This was the first large scale multi terminal HVDC transmission in the world when it was finalized 1992. It brings 2000 MW of hydro power more than 900 miles from Canada to the U.S.

New York Energy Market: Installed in 2004, ABB's SCADA/EMS is used to manage operations in the New York wholesale energy market, one of the largest and most complex in the world. The system provides information on pricing and demand, automated buying and selling facilities, and ancillary services.

Texas Energy Market: ABB's Market Management System (MMS) is being used to administer the wholesale power market in Texas. The software has enabled grid operator ERCOT, which serves 22 million customers, to establish a nodal electricity market and improve operational efficiency, reliability and market economics. It also ensures that the state's growing wind power resources are integrated into the system.

American Electric Power (AEP): AEP will implement ABB's new Asset Health Center solution to further enhance the performance and reliability of its transmission network. The solution will be applied across all AEP transmission substations system-wide.

Relion®

Protecting all in one



In 2005 ABB introduced the Relion 670 modular design for protection and control of transmission systems. This was followed in 2009 by the 650 compact design. Today, Relion's 670 and 650 series devices are efficiently protecting transmission, sub-transmission and generation assets in 150 countries. Relion, together with MicroSCADA, is the foundation for the Digital Substation and the smart grid.

The 670 series is still the most powerful and flexible solution for substation automation, control and protection available in the market today. One device can manage one or several objects and/or functions. The compact 650 series is especially suitable for new and retrofit applications in sub-transmission and as back up to the 670 in transmission. They are part of one concept, with two designs and numerous options to optimize monitoring, protection, control and automation of your grid connected assets.

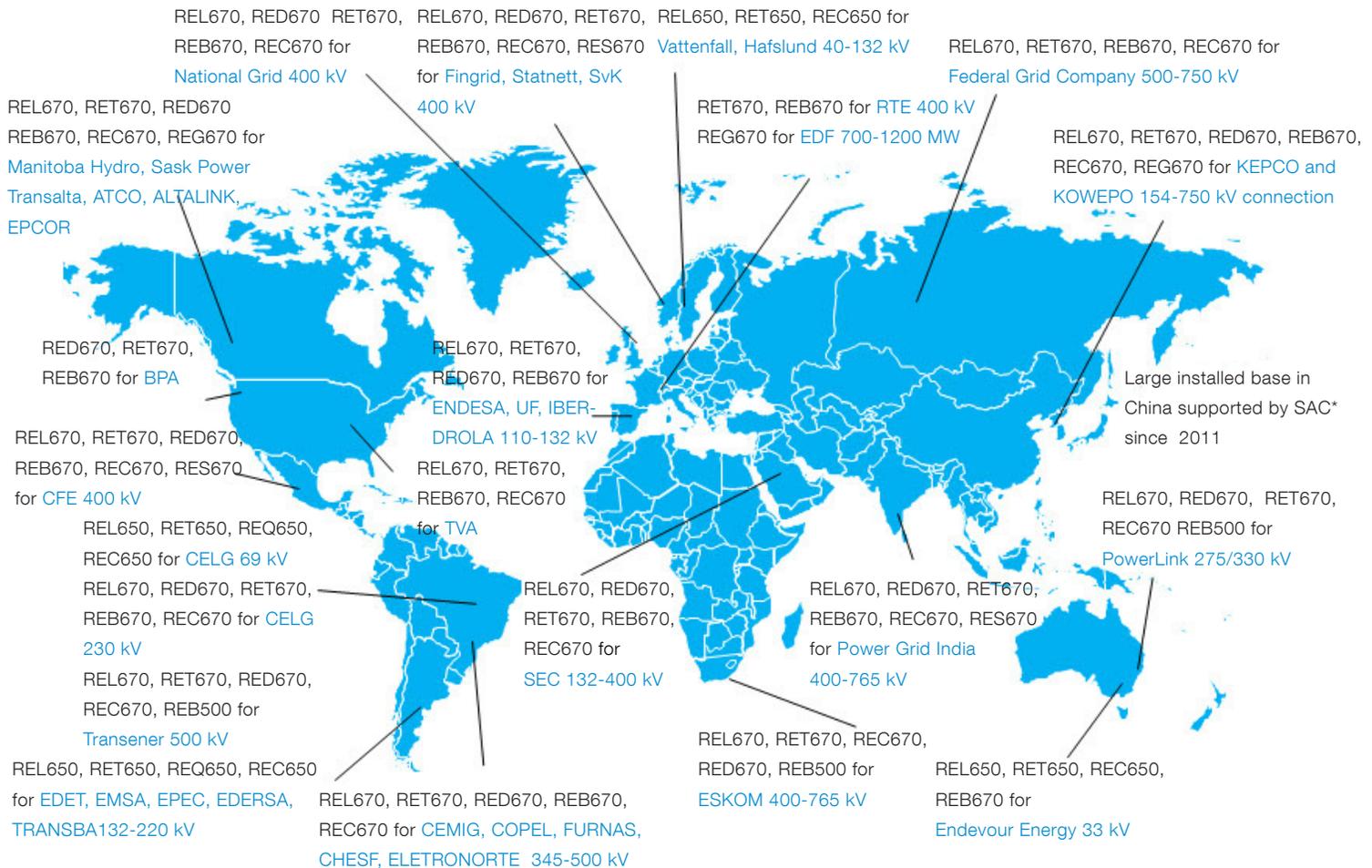
Based on our deep experience and knowledge of the power system, the Relion design offers unique and future-proof solutions for today and tomorrow.

- REG650 and REG670 for generators
- RET650 and RET670 for transformers
- REL650, REL670 and RED670 for lines and cables
- REQ650, REB650 and REB670 for breakers and busbars
- REC650 and REC670 for switchgear and capacitor banks
- RES670 for Wide Area Monitoring



Relion®

Global protection and control



Examples of Relion deliveries worldwide

Global experience for local perfection

ABB has the largest installed base of protection and control devices and systems for T&D applications. This includes electro-mechanical, static and digital designs. The introduction of Relion 670 series was a breakthrough in technology. Today, some of the world's dominant transmission companies use Relion to protect and control the most valuable assets in their 345–765 kV transmission systems. Hundreds of REG670 and RET670 devices are protecting large generators in South Korea, China and Brazil. The 650 series is installed around the world for sub-transmission and mid-sized generating stations, giving ABB and Relion unique experience to meet every application anywhere.

Stand-alone products and system integration migration

The 650 and 670 series are designed for IEC 61850 functionality, including parallel redundancy protocol (PRP), but fully support DNP 3.0 and other selected protocols. However, of all the 650 and 670 series devices we have delivered globally, more than 60,000 have been supplied with IEC 61850. Many of these

deliveries are for complete IEC 61850 based digital substation automation systems. Others are currently supporting other protocols, including DNP 3.0 today, but are ready to deploy an IEC 61850 architecture when the operator is ready.

Ready when you are

The Relion family of both transmission and distribution devices provide stand-alone retrofit solutions with DNP 3.0, but equally important, a migration to the digital substation and a smarter grid with IEC 61850.

*ABB joint venture Nanjing SAC Automation Co. Ltd.

Anything is possible For those thinking beyond the box



Not just a box, but rather a methodology. Designed to seamlessly consolidate functions, Relion is smarter, more flexible and more adaptable than any other “relay” in the market. Easy to integrate and with an extensive function library, Relion performs in ways others only dream of.

Instead of 100 boxes

- ONE configurable protection and control concept with ONE software tool
- TWO optional hardware designs with large built-in HMI
- THREE TCP/IP ports and optional PRP redundancy
- FOUR hardware sizes for required I/O modules
- 28 pre-configured and type tested applications
- CUSTOMIZED for your unique application

Increased reliability and optimized assets

Field tested multi-object capability is the next generation of protection and control - here today with Relion. Powerful enough to handle several protection and control applications within a single device, allowing you to do more with less, increasing reliability with fewer points of failure, minimizing supporting infrastructure, reducing engineering effort and lowering total cost of ownership with minimized O&M cost.

Future-ready and smart grid enabled

The higher level systems required to deliver on the promise of a

smarter grid require access to real-time actionable information from the process level to the enterprise level. Built on a foundation of IEC 61850, interoperable, supporting multiple communication protocols including DNP 3.0, Ethernet compatible and network-centric, Relion supports the modern technologies and architectures required to provide the real time intelligence needed for the future grid, today

Relion delivers performance and value

Relion provides state-of-the-art building blocks including interoperability and advanced solutions for monitoring, protection and control of the digital substation.

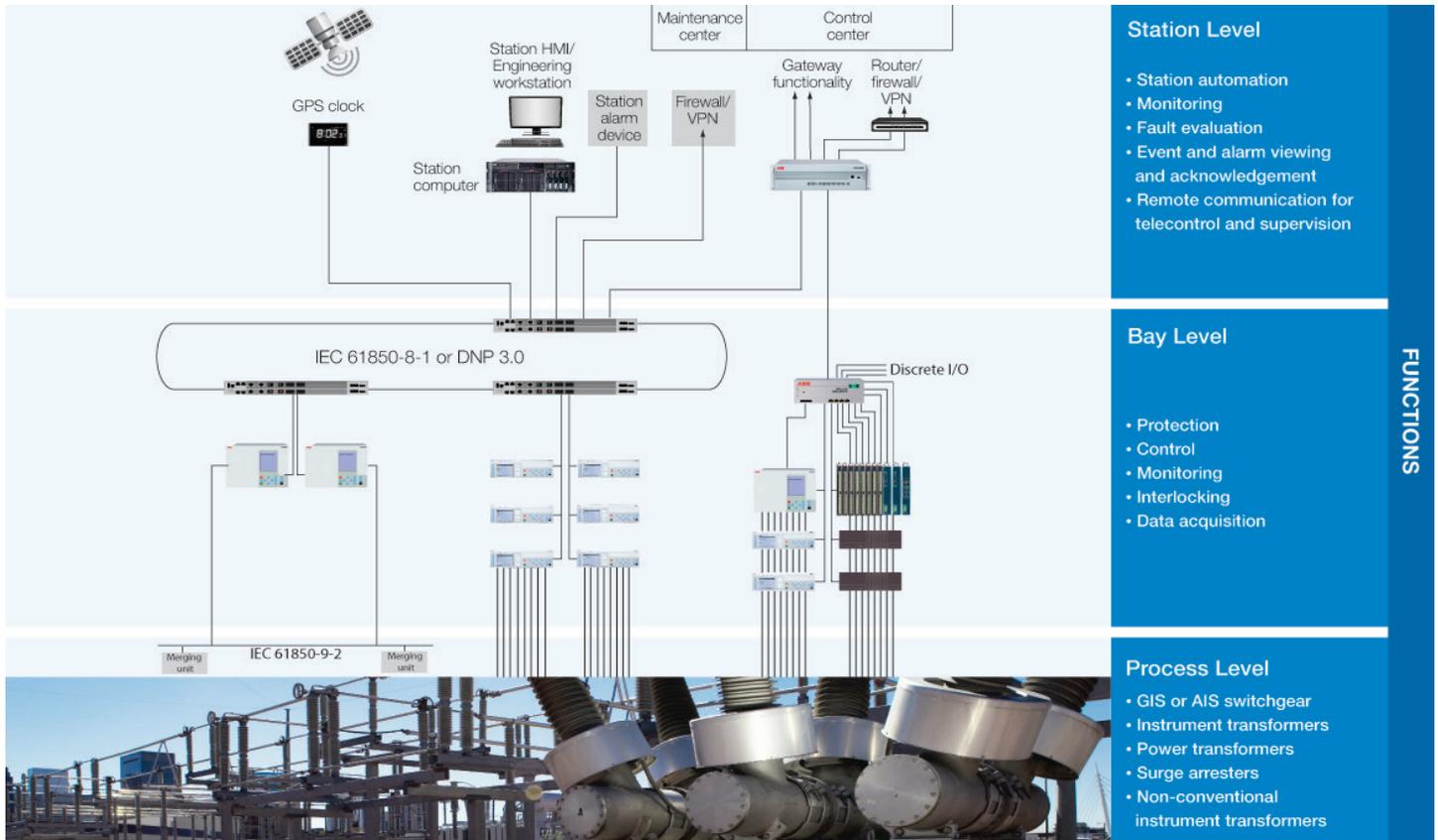
- Functional consolidation allows you to design more compact and efficient solutions, reducing footprint, wiring and work.
- Increased safety is achieved with digital optical communication and self supervision combined with state of the art redundancy and cyber security.
- Enhanced reliability and less complexity is obtained with reduced number of boxes and connections
- Simplicity is at hand when you learn one, you'll know them all. One harmonized and open concept with one powerful tool for all applications reduces training, spare parts and maintenance.

Step out of the box and into the future

Relion opens new possibilities. A sustainable investment able to competently support your protection and control needs today, and ready to seamlessly migrate to the efficiency of the optimized digital substation when you are.

Relion®

Designed to communicate



- Station Level**
- Station automation
 - Monitoring
 - Fault evaluation
 - Event and alarm viewing and acknowledgement
 - Remote communication for telecontrol and supervision

- Bay Level**
- Protection
 - Control
 - Monitoring
 - Interlocking
 - Data acquisition

- Process Level**
- GIS or AIS switchgear
 - Instrument transformers
 - Power transformers
 - Surge arresters
 - Non-conventional instrument transformers

FUNCTIONS

Example of migration to the digital substation

HMI, PCM600 and I/O

The 650 and 670 series have built-in large HMI display and function buttons which efficiently communicate locally with the technician or engineer. An additional PC can easily be connected to the front for communication with the PCM600 tool.

With PCM600 you can manage everything you need to read or write to the 650 and 670 series, but also other Relion products. You may configure and set your distance protection and then look at the graphical representation of the settings, or export the parameters as XRIO files to the test set. You may also extract events and disturbance recordings. Finally, you have access to all documentation directly when needed.

For IEC 61850 engineering and testing, the powerful IET and ITT tools not only support ABB hardware, but also others vendors' who comply with the IEC 61850 standard.

The 650 series has I/O modules for standard electrical analog connections. The 670 series have a large I/O library including static outputs as well as communication to remote I/O and digital communication for differential protection.

RTU, MicroSCADA and SCADA

Communication within substations, between substations and to remote control centers is not new but has evolved from slower analog to faster digital communication. A large number of different serial SCADA and RTU protocols have been used by different utilities and manufacturers around the world resulting in costly and time consuming work with "protocol converters". The evolution to defacto and IEC standards like DNP and IEC 60870 improved this, but it is with the development and global acceptance of IEC 61850 that the realization of future-proof and seamless interoperability has been achieved.

The 650 and 670 series are designed for IEC 61850 and fully support IEC 61850-8-1 and GOOSE with two ports for redundancy (PRP). DNP 3.0 is supported both for serial and Ethernet communication. The 670 series supports IEC 61850 9-2 LE allowing connection to merging units and non-conventional instrument transformers. ABB can supply complete solutions with RTU560 or MicroSCADA for IEC 61850 and DNP 3.0 as well as selected other protocols. This can also be integrated with ABB Network Manager for enterprise-wide SCADA and EMS systems, as well as wide-area monitoring systems.

Our offerings



ABB covers a wide range of products, systems, services and solutions for power systems automation and communication. In addition to Relion substation automation and protection, it includes Ventyx SCADA, EMS and DMS solutions and Tropos wireless communication. Based at the ABB Smart Grid Center of Excellence in Raleigh, NC we are the “one stop shop” for the digital substation and the Smart Grid - ready for the future, today.

Our products and systems cover all applications for generation, transmission grids and substations with:

- Superior performance of protection and control functions
- Proven proficiency, both globally and locally
- Comprehensive digital communications capability
- Designed for IEC 61850 with full support of DNP 3.0
- Powerful software tool suite to make it happen

Additionally, we supply COMBIFLEX® modular auxiliary relays and COMBITEST test switches for high current solutions with proven reliability from 40 years experience in all environments. Further, we support our Westinghouse electro-mechanical products and Flexitest™ test switches out of our center for Relion distribution products in Coral Springs, FL. Finally bringing it all together, ABB can supply engineered system solutions with RTU560 and MicroSCADA with both Relion and third party products.



Relion 670 and 650 series



COMBIFLEX auxiliary relays



RTU560 product family

Our services



Relion function configuration



Product support and testing of Relion 650 series



Product support and testing of Relion 670 series



System support and testing

What we can offer

- Visit, listen, educate and offer you Relion to evaluate
- Demonstrate our powerful substation automation tool suite
- Deliver your optimized Relion products and systems
- Respond to emergency/urgent customer needs
- World-class 10 year product warranty
- Advanced knowledge of ABB primary equipment and systems
- Regional support for relay applications and settings
- Regional support for system architectures
- Expert IEC 61850 implementation
- Relay school and fundamentals webinars
- Skilled local application and product support specialists
- Access to ABB global domain experts
- Configuration, testing and training
- Access to ABB global Product Verification Center
- Engineering, acceptance testing and verification
- Access to ABB global System Verification Center

Where you can find us

ABB Power System Automation and Communication together with the Smart Grid Center of Excellence are at the same location creating an ABB Power T&D hub for North America. This includes the engineering and support center for Substation Automation Products with Relion protection and control of transmission and generation applications as well as engineered Substation Automation Systems.

Additionally, substation automation, protection and control solutions are supported from regional support centers throughout North America as well as by the ABB network of regional sales and technical managers. Ventyx Network Management solutions are supported from Ventyx local offices.

Contact us

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