We are bridging the gap
Enabling Digital Substations
ABB’s Digital Substation is a core enabler to increase safety, productivity and reliability for grid operators and to reduce the overall substation cost.

Enabling a safer work environment while reducing construction and operational costs.

Digital Substations remove the last electrical connection between the high voltage equipment and the protection and control panels, creating a safer work environment, whilst reducing the costs for building, land, engineering, commissioning, operation and maintenance of the system. As a key component towards smarter grids, where utilities continue to integrate increasing amounts of intermittent renewable energy sources, Digital Substations will also help improve safety thanks to a shorter decision time in case of an emergency.
# ABB Digital Substations

## 06 100 Years of Substation Development

Dependable substation performance is a key factor for grid reliability. ABB has been designing and building substations since the 1900s.

## 08 The ABB Approach

ABB’s Digital Substation is a significant breakthrough innovation in substation technology.

## 12 Key Digital Substation Technologies

Thousands of copper signaling wires can be replaced by few fiber optic communication buses.

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### 36 - 37 Monitoring & Diagnostics

Thousands of copper signaling wires can be replaced by few fiber optic communication buses.

### 38 - 39 Transformers

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### 40 MicroSCADA Pro Historian

The modern electricity grid is a complex, intelligent mechanism that is indispensable to modern life.

### 41 SDM600 System Data Management

Between the high-voltage wires, and pressurized pipes, of a modern utility lies a second, equally important, network.

### 42 - 43 Asset Health Center

Predictive Analytics software designed specifically for Utilities. Overseeing the lifecycle of the electrical equipment required for utilities to do their job.

### 44 - 45 Network Manager™

Control center solutions to ensure secure and efficient energy system operation.

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### 46 - 47 Your Strategic Partner For A Changing World

Four key pillars of focusing on customer care, providing technical and functional support to help you meet your objectives.
Leading Substation Development For Over 100 Years

Dependable substation performance is a key factor for grid reliability. ABB has been designing and building substations since the 1900s.

Since then, we have supplied tens of thousands of air-insulated, gas-insulated and hybrid substations with voltage levels up to 1,200kV to a range of very different sites: from the most densely populated locations to the harshest environments on earth.

Our first major technological step was in 1965 by introducing gas-insulated switchgear (GIS) that reduced the footprint of substations. Alongside the development of GIS technologies, ABB has significantly improved the performance of conventional AIS substations. The latest innovation, the “combined” disconnector circuit breaker (DCB), integrates the disconnecting function into the circuit breaker. This eliminates the need for two separate free-standing disconnectors and reduces the footprint of the substation by more than 50 percent. ABB is the first company to develop this technology for voltage levels up to 500kV.

In the late 1980s, ABB innovations in substation automation replaced conventional protection and control systems with numerical ones. ABB is also dedicated to the development of industry standards, including those used in substation automation. ABB has been a driving force in the development and verification of the IEC 61850 substation communications standard since 1995. Since implementing the world’s very first IEC 61850 multi-vendor substation automation system in 2004, ABB has supplied thousands of products and systems for new and retrofit projects. ABB is the world’s leading supplier of air-insulated, gas-insulated and hybrid switchgear and substations, as well as IEC 61850 substation automation, protection and control solutions and systems.
ABB’s Digital Substation is a significant breakthrough innovation in substation technology.

It is based on the seamless integration of state-of-the-art IEC 61850 based control and protection IEDs with all relevant primary components and sensors of a modern substation. The primary components include extra-high and medium-voltage switchgear, as well as substation transformers.

The defining feature of a Digital Substation is the implementation of a process bus. The IEC 61850 process bus enables the substitution of point-to-point copper connections between IEDs, other devices (e.g. instrument transformers, gas monitoring, MotorDrive™, etc.) and switchgear by means of a safe, standardized optical communication bus. Thanks to the process bus, real-time measurement signals and status information can be broadcast throughout a substation without complex wiring schemes.

In the late nineties, ABB commissioned the world’s first Digital Substation in Australia for Powerlink, a transmission service provider in Queensland. Even though the concept has evolved since then, the basic principles remain the same: substituting heavy and bulky current and voltage sensors with small and integrated sensors and substitute signaling copper wires with fiber optic communication buses. From 2008 onwards, ABB introduced the IEC 61850-9-2 process bus between non-conventional instrument transformers and protection and control equipment.

Digital Substations enable electric power utilities to increase productivity, reduce footprint, increase functionality, improve the reliability of assets and, crucially, improve safety for service personnel. Digital Substations exploit the benefits of digital protection, control and communication technologies, mirroring the trend towards digitalization seen in many other industries.

This trend towards digitalization also applies to other areas of the substation. Within medium-voltage switchgear panels, the horizontal exchange of IEC 61850-8-1 GOOSE and sampled analog values reduces wiring and accelerates the testing and commissioning. Digitalized technology can now continuously monitor mission-critical functions of power transformers and High Voltage Switchgear, while performing real-time simulation and diagnostics, ensuring that the pro-active management of the assets lifecycle is now possible.

The availability of increasing amount of data in the substation calls for better solutions to turn this data into actionable information, and to ensure that data is properly and securely managed. The latest Substation Data Management and Asset Health management solutions offer means for a power utility to exploit the latest advances in this area.

ABB’s Digital Substation concept has also paved the way for well-known innovative switchgear solutions such as PASS (Plug and Switch System) and most recently the Disconnecting Circuit Breakers with integrated Fiber Optic Current Sensors (DCB with FOCS).

The ABB Approach
Thousands of engineering intensive and costly point-to-point copper signaling wires can be replaced by few fiber optic communication bus. The IEC 61850 standard safeguards the investment of the substation owners and enables interoperability between vendors of substation equipment.

Personnel safety is improved since less signal connections or inadvertently opened CT circuits can harm personnel during commissioning and service activities. Ultra-fast earthing switches installed in Medium Voltage cubicles prevent disruptive damages caused by a short circuit.

Digital Substations enable the reduction of the foot-print of a substation because less space is required for protection and control panels and functions previously executed by physically separate equipment can now be integrated in one device.

For example, in Air Insulated Substation (AIS) a Current Measurement transformer can be replaced by an optical sensor (Fiber Optic Current Sensor) and fully integrated inside a Life Tank Breaker together with disconnecting and earthing functions. In the case of an Air insulated Substation, the footprint can be reduced by 50% compared to a conventional solution.

Higher productivity can be achieved by means of new asset management systems with monitoring and diagnostics data from substation equipment. This feature substantially improves the efficiency of service activities. Monitoring and diagnostics is a strategic feature for utilities further reducing outage time and increasing reliability.

Transient stresses can be mitigated by means of point-on-wave switching which needs data from various sensors, meaning in many cases expensive closing resistors become obsolete.

To meet the increased need for the flexibility of the transmission and distribution grids, Digital Substations provide data and information that is required for the control of grid stability and for a quick response to changing grid conditions due to the integration of intermittent resources.

Digital Substations bring unseen opportunities for modern utilities. Higher reliability can be achieved by means of new asset management systems with monitoring and diagnostics data from substation equipment. This feature substantially improves the efficiency of service activities. Monitoring and diagnostics is a strategic feature for utilities further reducing outage time and increasing reliability.

Cyber Security
Protecting systems from cyber abuse or vandalism from the outside world.

Increased Safety
Digital Substation reduces the risk of electrocution owing to the substitution of copper by fiber optic cabling.

Higher Reliability
Less downtime with lower operational costs.

Improved Asset Management
Gain control of the substation hardware with second by second analysis and control.

Future Proof
Digital Substation enables faster implementation of future technologies.

Backwards Compatibility
Deep integration with legacy products, supporting utility communication from the past and into the future.

Reduced Cabling
Replacing copper with fiber optic cabling enables up to 60% reduction in copper cabling in the substation.

Reduced Footprint
More compact primary equipment and smaller relay rooms enable reduced substation footprint.

Reduced Maintenance
Permanent supervision of all data exchange reduces the need for periodic maintenance activities.

Software Based Testing
Safe testing with software based simulation and verification.

Lower CT Requirements
Digitizing data right in the field, reduces burden and lowers CT requirements.

Reduced Cabling
Replacing copper with fiber optic cabling enables up to 60% reduction in copper cabling in the substation.

50% Reduction of space in the switchyard*

40% shorter installation phase**

60% Copper cable reduction*

50% Outage time reduction***

* Based on a typical conventional 400kV double busbar AIS substation compared to a modern variant using SAM600 process bus IO system and FOCS integrated in disconnecting circuit breakers.

** Of new secondary systems. *** During secondary system retrofits
The substation automation, protection and control system solutions ensure reliable power transmission and distribution. To ensure interoperable and future-proof solutions, the substation automation, protection and control system has to be designed to implement the core values of the IEC 61850 standard.

The Communication Network inside the substation and from the substation to remote network control centers. These solutions fulfill the highest demands with respect to safety, reliability, and real-time response.

To deploy their full benefits for the owner and operator, the Digital Substation features have to be planned and designed during the specification phase. This ensures that in the medium term, substantial productivity gains are achievable in operation thanks to better asset utilization and thanks to synergies between various departments traditionally such as station control, automation and protection.

Traditional substations have always relied on copper cables wiring connecting together primary equipment like circuit breakers, conventional current and voltage transformers and protection relays. But digital technologies, communications and standards are driving the evolution of something new – Digital Substations.

Key Digital Substation Technologies

**Digitalization affects all relevant components and aspects of a substation**

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1. **High Voltage Primary Equipment**
   - Primary High Voltage switchgear in Air Insulated technology (AIS), Gas Insulated (GIS) or Hybrid Technology (PASS)
   - Non-conventional instrument transformers enable smaller substation footprint and easier engineering. Alternatively, existing CTs & VTs can be connected to Stand Alone Merging Units, which connect the analogue measurement signals to the process bus.

2. **Protection, Supervision and Control**
   - The substation automation, protection and control system solutions ensure reliable power transmission and distribution.
   - To ensure interoperable and future-proof solutions, the substation automation, protection and control system has to be designed to implement the core values of the IEC 61850 standard.

3. **Medium Voltage Switchgear**
   - Air and gas insulated switchgear solutions for primary and secondary distribution that suits various applications like railway power supply and wind farm integration.

4. **Communication Networks**
   - The Communication Network inside the substation and from the substation to remote network control centers. These solutions fulfill the highest demands with respect to safety, reliability, and real-time response.

Extending the Digital Grid

**Monitoring & Diagnostics**

Through remote access, the asset owner can evaluate the status of the equipment without dispatching an engineer to the site, saving both valuable time and resources. Since monitoring detects condition changes in real-time – versus periodically with traditional diagnostic methods – the asset owner has time to plan and act before faults occur.

**Historian and System Data Management**

Historian effortlessly collects, archives and enables you to visualize and analyze the primary process data. System Data Management software provides a solution for the automatic management of service and cyber security relevant data across your substations.

**Enterprise Software**

An unparalleled range of solutions for asset performance management, operations and workforce management, network control and energy portfolio management to help customers reach new levels of efficiency, reliability, safety and sustainability. With the capabilities to integrate information technologies (IT) and operational technologies (OT) to provide complete solutions to our customers’ business challenges.

**The Substation Evolution**

**Transition from conventional schemes to the Digital Substation**

Traditional substations have always relied on copper cables wiring connecting together primary equipment like circuit breakers, conventional current and voltage transformers and protection relays. But digital technologies, communications and standards are driving the evolution of something new – Digital Substations. 

1 2 3 4

Network Management

Serial Communication

Gateway

Gateway

IEC 61850

Conventional marshaling cubicle

Conventional marshaling cubicle

Conventional AIS bay

Conventional AIS bay

SCB with FOCS

Historian and System Data Management

Enterprise Software

Extending the Digital Grid

**Network Level**

**Station Level**

**Bay Level**

**Process Level**

1 2 3 4

Conventional

Modern

Digital
Innovative High Voltage Air-insulated Switchgear (AIS)

With Fiber Optic Current Sensor (FOCS)

ABB’s Fiber Optic Current Sensor, FOCS integrates into IEC 61850-9-2 process bus system supplying protection and control IEDs as well as revenue meters with accurate current measurements.

- An AIS solution for Digital Substations with integrated FOCS is available for both ordinary LTB (Live Tank Breakers) and Disconnecting Circuit Breaker (DCB). The DCB provides the functions of a circuit breaker and a disconnector combined in a single unit, thus giving 3 functions in one device: measurement, interruption and isolation.

Integrating the FOCS into Live Tank Circuit Breaker solutions provides the following advantages:

- Faster installation times; plug and play
- One FOCS replaces many CT cores, simplifying design and engineering substations
- Lower environmental impact
- More intelligent protection and control due to smart process bus interface
- Compact solution

FOCS-FS is the free-standing version of ABB’s FOCS technology. It is a non-conventional instrument transformer enabling digital HV substations and smart grids with an optical IEC 61850-9-2LE Ethernet output.

Beside inductive current transformers, oil or SF6 insulated, ABB has developed since 1990s optical current sensors, based on the Faraday effect principle, whereby light is used to deduce the precise magnitude of current that is creating the magnetic field. As a result, the design is inherently free of magnetic saturation, therefore suitable for capturing fast transient currents, short circuit currents, and alternating current (AC) with DC-offset.

FOCS-FS is a 3-phase sensor system consisting of:

- Three hollow insulators filled with nitrogen at ambient pressure and supporting the sensor heads
- One outdoor kiosk, installed on the steel structure of the central phase and connected via optical fiber to the three HV columns and to the relay house via a duplex ethernet optical cable (IEC61850-9-2LE protocol).

An opto-electronic module located in the kiosk:

- Sends polarized light to the sensor
- Receives the reflecting polarized light from the sensor
- Compares in close-loop control the phase displacement in the polarized light in proportion to the magnetic field and the primary current
- Converts the result into an optical IEC 61850 Ethernet output.

The level of redundancy that can be specified is given by the number of opto-electronics units integrated in the system.

All solutions can be equipped on request with merging units, which digitalize analog signals coming from voltage transformers, synchronize those signals with the digital signal coming from FOCS-FS and consolidate both signals into a digital output stream complying with IEC61850-9-2 LE protocol.
Innovative High Voltage Hybrid Switchgear

PASS (Plug And Switch System)

The PASS for Digital Substations is a compact hybrid switchgear fully assembled and high-voltage tested in factory, for rapid installation and energization. PASS can leverage Digital Substation features such as the Motor Drive™ and an intelligent local control cabinet fully enabled with IEC 61850 communication protocol.

Motor Drive™

Motor Drive™ 1.4 is a digitally controlled servomotor that drives the contacts of a high-voltage circuit-breaker contacts with the highest precision, while the energy necessary to enable the operations is stored in capacitors. The input/output (I/O) and interlocking of the PASS module are managed by electronic boards, which can be easily configured at any stage of the project. The switchgear is equipped with an electronic local control cabinet which enables the high voltage switching bay to be operated digitally with a Human Machine Interface.

Intelligent Local Control Cabinet (I-LCC)

The I-LCC embeds the configurable logic needed to integrate typical local control cabinet components (e.g., interlocking) and to control auxiliary devices. It also guarantees smooth integration into substation automation systems using IEC 61850, bringing the technology to continuously monitor the functions of the switchyard, whilst performing real-time simulation and diagnostics, allowing pro-active management of the life-cycle of the asset and remote service intervention.

Operating features include:
- Low operation forces
- Simple installation without adjustment
- Advanced self-monitoring system
- Only one (1) moving part in the drive
- Low stable power consumption
- Extremely low noise level

Diagnostics

Motor Drive™ collects and stores a wide array of data that can be downloaded and analyzed. Stored events of the circuit breaker’s activities and detailed information about the latest operations are available. Supervisor and diagnostic module of Motor Drive™ verifies that the system is working correctly; it continuously monitors:
- The function of all boards and internal supplies
- The integrity of interlocking
- The functionality of motor control chain

The auto-monitoring functionality, together with the dramatic reduction of mechanically moving parts, gives outstanding reliability, and has been tested for 30,000 close/open operations.
ABB’s digital GIS comes integrated with non-conventional instrument transformers (NCIT), that increase operational safety, simplify switchgear design and reduce switchgear footprint. The IEC 61850 process bus replaces conventional copper cabling between local control cubicle and protection cubicle.

The measurement signals are provided by two redundant Rogowski coils for the current and 2 redundant capacitive ring sensors for the voltage. The low power analog signals from these sensors are converted to a digital signal in redundant electronic modules mounted directly at the sensor. The sensors are sealed for life and repair or replacement during the life cycle of the primary equipment is not needed. The electronics mounted on the sensor enclosure however is pluggable and can be changed easily.

The digital signals of the NCITs are collected by a merging unit and broadcast to protection IEDs via the process bus based on the IEC 61850-9-2 standard. Contrary to conventional CTs, the dynamic range and accuracy of the sensors cover metering, measurement and protection requirements and therefore the engineering process can be simplified.

ABB offers the NCIT CP sensor based on the Rogowski coil principle and on voltage capacitive dividers for metering, protection and control accuracy in a single device. The CP sensor can be physically integrated into metal enclosed switchgear like GIS, DBB (Dead Tank Circuit Breakers), Hybrid Switchgear and MFM (Multi Functional Modules). A redundant set of Rogowski coils and the capacitive voltage sensors are integrated in a concentric HV switchgear conductor segment, the sensors are redundant by installing two separate systems. The analogue signals are converted to digital and processed directly at the sensor.

The control IEDs are mounted in the control cubicle at the GIS bay where all the binary signals to and from switches for a bay are connected and from there the signals are broadcast by means of a process bus. Alternatively, the protection IEDs can be integrated in the local control cubicle as well. The ABB metal enclosed circuit breakers NCIT merging unit was the world’s first to be conformance certified by UCA International Users Group.

With multiple Ethernet ports and connections to NCITs, it offers high flexibility to system design or any switchgear layout and provides largely fail-safe communication networks between NCITs and control/protection IEDs. This arrangement eliminates most of the point-to-point signaling wires between the bay cubicle, the protection and to the station level.

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The CP-MU merging unit combines and synchronizes the current and voltage measurements from the sensors on the individual phases to IEC 61850-9-2 process bus information.

- World’s first UCA-certified IEC 61850-9-2LE compliant merging unit
- Interfaces with sensors of up to three three-phase measuring points
- Reducing the number of components in 1and 1⁄2 breaker and double busbar arrangements
- Multiple Ethernet ports bring high flexibility to system design
- Reducing the need for Ethernet switches in protection circuits
Upgrading Existing conventional substations can be upgraded to Digital Substation by introducing a process bus connection to conventional.

More efficient project delivery and installation
Reduction of field cabling not only reduces the use of expensive copper, but minimizes engineering efforts, installation and on-site testing.

Unrivalled flexibility
SAM600 is designed around one hardware module per primary object - SAM600-CT and SAM600-VT for interfacing any conventional current or voltage instrument transformers, and optionally SAM600-TS for time synchronization, either standalone or in combination with a GPS clock. The modules can be chained into a system to optimally adapt to different application types - “the sum is more than the whole of its parts”.

Upgrading
Existing conventional substations can be upgraded to Digital Substation by introducing a process bus connection to conventional.

Efficient design and operation
Strict adherence to the IEC 61850 standard results in futureproof installations that take advantage of enhanced tool suites for engineering and testing, such as ABB’s IET600 system configuration tool and ITT600 SA Explorer for simple and efficient testing.

Built in supervision functionality, via IEC 61850, minimizes the need for periodic maintenance.

The SAM600 system synchronizes sampling and delivers complete IEC 61850-9-2 real-time data streams to the IEDs. SAM600 can be connected to feeder control and protection as well as to the decentralized busbar protection REB 500.

Upgrading
Existing conventional substations can be upgraded to Digital Substation by introducing a process bus connection to conventional.

Optimal placement of modules
SAM600 comes in a compact form factor and is DIN-rail mountable for fast installation and replacement. It can be installed in existing protection and control panels, or placed close to primary apparatus in a marshalling kiosk or VT terminal box in the switchyard.

Safe and simple testing and maintenance
Customizable terminals allow the use of standard cables, tools and work procedures. This reduces training needs for installation, testing and maintenance. One module terminates all signals of a primary apparatus, including both main and auxiliary signals such as test switch or fuse failure supervision. This substantially reduces cross wiring and allows an engineer to work on one object without influencing others.

The modular design of SAM600 enables safe, efficient, and stepwise retrofit of any substation in AIS or GIS technology. In order to maximize the benefits of IEC 61850 process bus, SAM600 modules are placed in marshalling kiosks across the switchyard close to the primary apparatus.

SAM600 bridges the gap between analog and digital worlds and enables the upgrading of existing conventional substations to Digital Substations with IEC 61850 process bus as it interfaces any conventional instrument transformers.

Distributing current and voltage information digitally through optical fibers reduces the risk of wrong handling of current and voltage circuits, increases personnel safety and reduces the risk of equipment failure. The current and voltage signals, once digitized, can be made available wherever needed inside the substation and elsewhere.

The modular process bus systems can be tested in the factory, from station automation system down to the process interface units. This minimizes the installation, cabling and commissioning time when deploying the pretested system on site.

Constant supervision of all electronic components and digital communication in the substation minimizes the need for periodic maintenance and allows for faster remedial action in case of failure.

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Multiple communication ports allow for simple and highly flexible process bus architectures, minimizing the need for Ethernet switches.

SAM600 process bus IO system can combine current measurements acquired from next-generation sensors, such as ABB’s FOCS, with voltage measurements from conventional VTs.

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Relion®

The power of one solution for protection and control

ABB’s substation automation platform is the industry benchmark for all substation control and protection applications including Medium Voltage and High Voltage applications. The core of the platform is the Relion® product family.

Relion® is the most complete product family for Substation automation, control and protection. It starts with the 605 series, a simple Relay for Distribution Automation application and ends with the high-end 670 series for transmission applications. The relays are multi-functional units with flexible and configurable control, protection, communication, monitoring and diagnostics functionality.

The Relion® product family offers the widest range of products for the protection, control, measurement and supervision of power systems for IEC and ANSI applications. To ensure interoperable and future-proof solutions, Relion® products have been designed to implement the core values of the IEC 61850 standard. Users benefit from ABB’s leading-edge technology, global application knowledge and experienced support network.

The IEC 61850 compliant Protection and control IED manager PCM600 tool provides versatile functionalities for the entire life-cycle of all Relion protection and control IED applications, at all voltage levels.

Relion® 670 series

IEDs for protection and control

Relion® 670 series of protection IEDs support IEC 61850-9-2 sampled analog values. All devices can process multiple sample values streams and also operate in mixed configurations with sampled values and conventional wired current and/or voltage signals.

The line protection is performed by the REL670 for distance protection and RED670 for line differential protection. Line differential protection supports multi-ended transmission lines with conventional and/or digital current measuring at the remote end substation(s), if permitted by the line differential communication method, the line differential protection can operate without GPS clocks, mirroring conventional setups where the “echo mode” of RED670 is used.

All IEDs with IEC 61850-9-2 enabled, as for example RET670 transformer differential protection can either work with all digital currents, measured by NCITs or conventional CTs and digitized by stand alone merging units like SAM600, or it can work in mixed configuration with some currents provided as sampled values and other wired conventionally from traditional CTs.

The phasor measurement unit RES670 is fully compliant with standard for Synchrophasor Measurements for Power Systems, IEEE C37.118-2011 including the amendment IEEE C37.118 1-2014, IEC 61850-9-1, IEC 61850-9-2 communication capabilities enable easy integration of RES670 in substation automation systems. Several protection and control functions of the Relion 670 series IEDs are available in RES670.

Relion® REB500

Distributed busbar protection

For busbar protection and breaker failure protection, ABB provides a REB500 distributed busbar protection system. The REB500 bay units interface to the IEC 61850-9-2 sampled values. The REB500 busbar and breaker failure protection system is designed to work without station wide synchronization of analog sampling to provide highest availability of the protection.

The distributed busbar protection system can operate with process bus as well as conventional current and voltage values. This enables for example seamless extensions of existing installations.

PCM600

Simplifying management of protection and control relays

PCM600 interacts with IEDs over the fast and reliable TCP/IP protocol via a corporate LAN or WAN, or alternatively directly through the communication port at the front of the IED. It is able to read and write all configuration and setting data of an IED with a single command.

PCM600’s unique graphical application configuration concept enables configuration and monitoring of the complete IED application from input to output. The online monitoring allows an easy and fast testing of all protection and control functions.

The IEC 61850 standard-compliant PCM600 allows a seamless integration of Relion IEDs into any IEC 61850 system. PCM600 and Relion IED series are the perfect solution for any protection and control application.

Relion® 670 series

Safeguarding your investment

Continuous monitoring and protection of the primary equipment.

Utility grade protection

Electromagnetic compatibility compliant with IEC 60255 and IEEE/ANSI C37.90.

Critical application reassurance

Redundant communication for 100% availability.

Relion®

The power of one solution for protection and control

Relion® 670 series

IEDs for protection and control

Relion® REB500

Distributed busbar protection

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Critical application reassurance

Redundant communication for 100% availability.
Easily define the substation layout using a Single Line Diagram editor with a palette of built-in primary equipment.

**Key features of the Integrated Engineering Tool IET600**

- Design and specification of the substation topology in a graphical Single Line Diagram editor
- Consistent configuration of the complete dataflow communication between all IEC 61850 IEDs in the substation
- Definition of complete substation configuration in an SCD file according to IEC 61850, including substation topology and communication structure and dataflow
- Configuration of a wide range of IEC 61850 communication services, including MMS, GOOSE and sampled values.
- Flexible configuration of communication networks to adapt to various substation layouts and system size.
- Centralized management of station and gateway-level signals that ensures data consistency throughout the substation.
- Reuse of previously engineered station and gateway level signals between multiple IET600 projects.
- Management and comparison functions for SCL-based files allow engineers to manage changes and ensure consistency during pre-ject execution.
- Import, utilize and create SCL conformant files for usage with any IEC 61850-compliant devices and tools in the market.
- Export project data and graphics in Excel and PDF for documentation.

**ITT600 Integrated Testing Tool for IEC 61850 Digital Substation**

Integrated Testing Tool, ITT600 SA Explorer, is designed for easy diagnosis and troubleshooting of IEC 61850-based substation automation systems and applications. It features convenient navigation, comprehensive presentation of application data, and support for system consistency check both on-line and off-line. This allows anybody to use the same tool to analyze and debug substation automation applications regardless of their level of knowledge of IEC 61850 communication.

The ITT600 SA Explorer tool offers facilities for exploring and analyzing the communication configuration of the protection and control IEDs (Intelligent Electronic Devices) and IEC 61850 communication in substation automation systems, including GOOSE messages. Its versatile functionality eliminates the need for multiple testing tools for different purposes, such as MMS browsers, and protocol and Ethernet analyzers.

The powerful features of ITT600 SA Explorer provide test engineers with access to any IEC 61850-compliant IED. The tool’s various functions allow efficient testing of the IED application and isolate the root cause of system communication problems. This significantly reduces testing and commissioning time in a fully Digital Substation. ITT600 SA Explorer is easy to use, and does not require the skills of a data communication specialist. By translating the complex terminology of communication protocols into the standardized IEC 61850 language, it makes the essential information available to all users.

- Exploration of the complete IEC 61850 communication configuration of ABB’s Relion® protection and control IEDs and third-party IEDs
- Comparison of any two SCL-based (substation configuration description language) files at the same time, for instance, comparison of two .scd files to identify the differences between them
- Simulation of an IED based on the loaded data model for both MMS and GOOSE communication
- Manual and automatic comparison of the system configuration description (.scd) and the deployed IED configurations to ensure data consistency
- Unique graphical visualization of the data flow within an IEC 61850-based system to verify and, if needed, optimize the data flow
- Visualization of GOOSE data in an Oscilloscope style view simultaneously for several IEDs showing correlations and time measuring. This enables faster debugging and troubleshooting
- Visualization of IEC 61850-9-2 LE sampled value streams in a phasor and Oscilloscope style view
- Process event list with filtering and exporting capabilities to support testing and commissioning of the IEDs
- Documentation of the system configuration revisions and IED firmware versions to keep track of the changes in the system
- Support for decoding and analysis of substation automation-related Ethernet-based communication protocols, such as IEC 61850-8-1, IEC 61850-9-2, IEC 60870-5-104, DNP 3.0/TCP and Modbus/TCP

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MicroSCADA Pro

Station level HMI and independent gateway

MicroSCADA Pro SYS600 is a modular and scalable software for real-time monitoring and control of primary and secondary equipment in substations. It is designed for complete functionality for real-time monitoring and control of primary and secondary equipment in transmission and distribution substations. It allows easy and safe interaction with protection and control IEDs, as well as with the process via the operator’s workplace. This way, it effectively promotes taking the right actions and achieving the maximized availability of a Digital Substation.

Apparatus Safety

MicroSCADA Pro prevents simultaneous operation of primary equipment. It reserves the device and verifies whether the selected object can be operated before executing commands. Additionally, station wide interlocking schemes, which are complementary to the bay level interlocking, prevent dangerous operations that might otherwise damage primary equipment.

Optimized Maintenance

The system allows the definition of automatic alarms to optimize the timing of maintenance through monitoring the number of breaker operations, fault and disturbance statistics and motor start-ups. Right and reliable information is the basis for correct and safe operations. MicroSCADA Pro maximizes information availability by supporting redundant system servers and communication at any substation in every situation.

Secure Operations

Cyber Security

Protect systems from abuse or vandalism

A large number of cyber security features that protect systems from abuse or vandalism are built into the MicroSCADA Pro portfolio. New cyber security features are designed to meet and exceed requirements from standards such as IEC 62351, IEEE 1686 and NERC-CIP.

Personnel Safety

MicroSCADA Pro increases personal safety in many ways

The breakers and disconnectors are operated from a separate control room in the substation. The system allows the definition of authorization levels for different user categories to prevent unauthorized actions. Intuitive and consistent icons with selectable and pre-defined color schemes enhance the visual comfort for the operator. This makes it easy to master the overall harmony of the various information displays in your interface, and get familiar with the system quickly.
UniGear Digital

UniGear Digital is a new solution implemented to the traditional UniGear switchgear. It is accomplished by using well-proven components such as current and voltage sensors, Relion® protection relays and IEC 61850 digital communication.

The current sensors used are of highly compact design, optimized for the use in UniGear. Each panel can accommodate two sets of current sensors.

The voltage sensors are very compact as well. They are integrated as part of support insulators housed in the cable compartment or built directly in the busbar compartment.

The current and voltage sensors are of very high accuracy (accuracy class 0.5), however revenue metering might require yet higher accuracy classes or the installation of instrument current and voltage transformers for separation purposes. The transformers can optionally be added to sensor-equipped panels. Capacitive voltage detection is enabled by capacitive dividers that are either integrated into the support insulators or into a conventional current transformer used on case-by-case basis.

UniGear Digital features
- Covers whole single busbar portfolio of UniGear family
- Available for applications up to 24kV, 4000A and 50kA
- Current and voltage sensors with accuracy class 0.5
- Relion protection and control relays with IEC 61850-9-2LE

UniGear Digital benefits
- Smart grid flexibility
- Minimizes lifetime costs
- Quick delivery
- Flexibility during switchgear operation
- Reliability and safety
- Space saving solution
- Green solution
- Customization and changes

Current sensors for UniGear Digital

Electronic Instrument Transformers (Sensors) offer an alternative way of making the current measurements needed for the protection and monitoring of medium voltage power systems. Sensors based on alternative principles have been introduced as successors to conventional instrument transformers in order to significantly reduce size, increase safety, and to provide greater rating standardization and a wider functionality range. These well-known principles can only be fully utilized in combination with versatile electronic relays.

Construction of ABB’s current sensors is done without the use of a ferromagnetic core. This fact results in several important benefits for the user and the application. The main benefit is that the behavior of the sensor is not influenced by non-linearity and width of hysteresis curve, which results in a highly accurate and linear response over a wide dynamic range of measured quantities.

A linear and highly accurate sensor characteristic in the full operating range enables the combination of metering and protection classes in one winding. With KECA 80 Cxxx sensors measuring class 0.5 is reached for continuous current measurement in the extended accuracy range from 5% of the rated primary current Ipr not only up to 120% of Ipr (as being common for conventional current transformers), but even up to the rated continuous thermal current Ith. For dynamic current measurement (protection purposes) the ABB sensors KECA 80 Cxxx fulfill requirements of protection class 5P up to an impressive value reaching the rated short-time thermal current 8Ith. That provides the possibility to designate the corresponding accuracy class as 5P630, proving excellent linearity and accuracy measurements.

Current measurement in KECA 80 Cxxx sensors is based on the Rogowski coil principle. A Rogowski coil is a toroidal coil, without an iron core, placed around the primary conductor in the same way as the secondary winding in a current transformer. However, the output signal from a Rogowski coil is not a current, but a voltage.

Current sensors for MV panels features
- Linear characteristic
- No magnetic core
- Combined accuracy class of 0.5 for metering and 5P630 for protection purposes
- Wide dynamic range reaching values up to rated short-time thermal current
- Very compact mechanical design to better fit into MV switchgear
- Safe secondary outputs
Electronic Instrument Transformers (Sensors) offer an alternative way of making the voltage measurement needed for the protection and monitoring of medium voltage power systems. Sensors based on alternative principles have been introduced as successors to conventional instrument transformers in order to significantly reduce size, increase safety, and to provide greater rating standardization and a wider functionality range. These well-known principles can only be fully utilized in combination with versatile electronic relays.

Construction of ABB’s voltage sensors is done without the use of a ferromagnetic core. This fact results in several important benefits for the user and the application. The main benefit is that the behavior of the sensor is not influenced by non-linearity and width of hysteresis curve, which results in a highly accurate and linear response over a wide dynamic range of measured quantities. A linear and highly accurate sensor characteristic in the full operating range enables the combination of metering and protection classes in one device. Voltage measurement range for metering accuracy class 0.5 and protection accuracy class 3P.

Voltage measurement in KEVA B sensors is based on the resistive divider principle. The output voltage is directly proportional to the input voltage.

Voltage sensors for UniGear Digital

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Voltage measurement in KEVA B sensors is based on the resistive divider principle. The output voltage is directly proportional to the input voltage.

Voltage sensor for MV panels features
- Compact mechanical design to better fit into MV switchgear
- No ferroresonance phenomena
- Safe secondary outputs
- Only 2 types covering the voltage range up to 24kV

Arc Fault Protection

Innovative arc flash mitigation in less than 4 ms: the highest possible level of arc flash protection for personnel and equipment, maintenance of a secure power supply and the reduction of production stoppages.

The occurrence of an arc fault, the most serious fault within a switchgear system, is mostly associated with extremely high thermal and mechanical stresses in the area concerned. A new, active arc fault protection system is based on the know-how gained from decades of experience with the ABB vacuum interrupter and IS-limiter technology. This latest arc fault mitigation technology now effectively helps to avoid these negative effects if a fault should occur.

The Ultra-Fast Earthing Switch of type UFESTM is a combination of devices consisting of an electronic unit and the corresponding primary switching elements which initiate a 3-phase short-circuit to earth in the event of a fault. The extremely short switching time of the primary switching element in conjunction with the rapid and reliable detection of the fault, ensures that an arc fault is extinguished almost immediately after it arises (Extinguishing time < 4 ms after detection).

The UFES electronics are available in two designs. In this portfolio, the electronic detection and tripping unit (DTU) type QRU1 provides an expandable complete solution with internal light and current detection, which is able to protect small protection areas without any additional devices.

On the other hand, the electronic tripping unit (TU) type QRU100 uses only external detection units for monitoring of the protected area. In this context, the TU suits ideally for the connection to the ABB arc protection system type REA. Compatible and accordingly tested interfaces are available for this purpose.
Protection and control relays represent the control center of a switchgear panel. UniGear Digital uses 615 and 620 series types of protection and control relays from ABB’s Relion family.

**Relion® 615 series IEDs for protection and control**

The Relion® 615 series protection relays can be defined as a compact and versatile solution for power distribution in utility and industrial applications. The 615 series provides standard configurations, which allows you to easily adapt and set-up your applications, still allowing you to adapt the configuration according to application-specific needs. The 615 series combines compactness and powerful features in one smart package. Out of 615 series we have three dedicated product types available for UniGear Digital – REF615, REM615 and RED615.

**Feeder protection and control REF615**

REF615 is a dedicated feeder protection relay perfectly aligned for the protection, control, measurement and supervision of utility and industrial power distribution systems including radial, looped and meshed networks, also involving possible distributed power generation.

**Motor protection and control REM615**

REM615 is a dedicated motor protection relay perfectly aligned for the protection, control, measurement and supervision of asynchronous motors in manufacturing and process industry. REM615 offers all the functionality needed to manage motor starts and normal operation also including protection and fault clearance in drive and network disturbance situations.

**Line differential protection and control RED615**

RED615 is a phase-segregated, two-end, line differential protection and control relay. With in-zone transformer support and voltage protection, it is perfectly harmonized for utility and industrial power distribution networks. The RED615 relays communicate between substations over a fiber-optic link or a galvanic pilot wire connection. Protection of ring-type and meshed distribution networks generally requires unit protection solutions, also applied in radial networks containing distributed power generation. With relation to UniGear Digital solution this protection relay will be used for more dedicated applications only.

**Relion® 620 series IEDs for protection and control**

The Relion® 620 series protection relays increase flexibility in demanding utility and industrial applications for power distribution.

They are delivered with example configurations to ease adaptation into your specific applications. The series offers customization possibilities, which supports higher levels of standardization in the applications. The 620 series extends the hardware possibilities further compared to the 615 series. From within the 620 series we have two dedicated product types available for UniGear Digital – REF620 and REM620.

**Feeder protection and control REF620**

REF620 is a dedicated feeder IED perfectly aligned for the protection, control, measurement and supervision of utility and industrial power distribution systems, including radial, looped and meshed distribution networks.

**Motor protection and control REM620**

REM620 is a dedicated motor IED perfectly aligned for the protection, control, measurement and supervision of medium size and large asynchronous motors, requiring also differential protection, in the manufacturing and process industry. Typically, the motor protection IED is used with circuit breaker- or contactor-controlled MV motors and with contactor-controlled, medium-sized and large LV motors, in a variety of drives.

**Remote I/O unit RIO600**

The remote inputs/outputs unit RIO600 is designed to expand the digital and analog inputs/outputs of ABB’s Relion® protection relays and provide inputs/outputs for the station automation device COM600 using the IEC 61850 communication.
FOX615
Enabling seamless migration and extension of existing communication infrastructures

ABB’s FOX615 is a hybrid solution supporting traditional TDM (PDH / SDH) and Multi-Protocol Label Switching - Transport Profile (MPLS-TP) – the latest standard designed to address the new applications using packet switched technology natively. The majority of existing communication networks of power utilities are based on Time Division Multiplexing, TDM, which allocates dedicated circuits to specific communications and thus guaranteeing the required communication performance parameters such as bandwidth, latency and symmetry. New standards today are based on packet switched technologies (e.g. IEC 60870-5-104 or IEC 61850) and therefore integrate natively into a packet switched MPLS backbone network.

Well known features of SDH networks were left behind when MPLS was originally created for dynamic public telecommunication networks and implemented as IP/MPLS. That’s why an enhancement of the standard was required, leading to MPLS-TP bringing back those missing features from SDH to the MPLS world such as bidirectional and static channel routing or end to end channel supervision using Operational Administration Maintenance (OAM). FOX615 provides native MPLS-TP and SDH functionality as part of the hybrid approach implemented.

The combination of state of the art SDH technology and future MPLS-TP technology provides an easy and flexible way to migrate technology in a utility network. FOX615’s which are deployed in the field today can easily be upgraded to MPLS-TP. It also allows the parallel implementation of SDH and MPLS-TP in one node, separating traffic according to their performance requirements. One further option is to just implement a pure MPLS-TP node. FOX615 today offers much more to a utility than any other multiservice platform for real-time utility communications.

FOX615 the utility communication solution
FOX615 is designed to be deployed in harsh environment ranging from extreme temperatures to magnetic and electrical fields, which can be particularly severe during short-circuit events. Furthermore it includes integrated teleprotection interfaces for distance as well as for differential protection. These interfaces are designed to work in TDM as well as in MPLS-TP networks. Especially the implementation of differential protection over PSN networks imposes huge challenges, as the PSN inherent jitter has to be compensated to guarantee a reliable functionality. FOX615 can guarantee the communication channel performance required of those critical application. Additionally FOX615 provides the possibility to distribute exact Time of Day information, pass it on to end devices and can help to become more independent of any 3rd party clock source e.g. GPS.

FOX615 - allowing stepwise migration from SDH to MPLS-TP with guaranteed performance

An outstanding multiservice platform for real-time utility communication

FOX615 Multiservice Platform
Guaranteed communication performance for critical applications

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In a Digital Substation, data becomes easily available for various purposes. In particular, data can be analyzed from an operations perspective but also for maintenance purposes. Ultimately, this allows straightforward implementation of data-driven maintenance strategies like reliability centered maintenance. For the precise automatic assessment of HV equipment, condition monitoring systems provide additional, key parameter for the asset management system. Examples of such parameters are continuous SF6 density in a GIS or ablation factor for a GCB.

ABB’s monitoring systems are applicable for new substations and for retrofitting of existing installations. They map all available data and warning / alarm information via IEC 61850 to the station bus. Additionally, an embedded web server allows access to the data via an Ethernet port. The port can be connected to a wireless LAN interface which enables access to the data on handheld devices including tablets or smartphones inside the substation building.

Modular Switchgear Monitoring (MSM)

The Modular Switchgear Monitoring (MSM) is an add-on system to continuously supervise SF6 density in enclosures of high-voltage gas-insulated switchyards. The system is suitable for all kinds of switchgear layouts and operates independently of control and protection devices. MSM is applicable for retrofit of existing substations and for new installations.

Early warnings reduce SF6 emissions and enable the operator to plan maintenance/repair work. MSM uses SF6 density sensors based on quartz crystals to directly measure gas density. The sensors have an excellent long-term stability performance, identifying leakages long before becoming critical.

Applications
- SF6 density monitoring in Gas Insulated Switchgear and Metal enclosed Breakers
- Optimize maintenance by using trend calculation
- Provides data for remote condition monitoring and advanced maintenance strategies

Generator circuit-breaker monitoring system GMS600

ABB’s next generation monitoring system GMS600 further enhances generator circuit-breaker (GCB) monitoring. It’s built on the already established GMS600 technology, which monitors the contact ablation factor. The updated version offers additionally, unique features such as SF6 gas monitoring and trending (GMS600-G), temperature monitoring of primary conductors (GMS600-GT) and enhanced operating drive supervision.

Based on ABB’s well-proven Relion® Series 650, GMS600-G and GMS600-GT provide an accurate indication of time remaining before the GCB needs servicing, an efficient data logging system and an intuitive network interface via web client application. They are applicable for retrofit of existing substations and for new installations. GMS600 supports the overall increase of power plant safety and reliability whilst enabling cost-effective lifetime management by the innovative Value Base Customer Care (VBCC) concept of ABB. This concept combines sophisticated, prognostic algorithms for data analysis of GMS600 data with ABB experts experience in order to give asset specific service recommendations.
CoreTec™ continuously monitors mission-critical functions of the transformer and traces the history. It simulates various possible operating conditions and forecasts the impact on the transformer’s lifecycle.

The system is modular and scalable to cope with present and future requirements. It offers higher functionality than comparable systems. CoreTec™ is guaranteed to be maintenance free for 15 years.

The device is compact and easy to install for new and retrofit installations. Only a few sensors are required, cabling is minimized. No specific additional hard- or software is needed. The unit displays important operating parameters in a user-friendly web interface.

CoreTec™ is an intelligent, safe and reliable solution for predictive transformer service management. It fits to most transformers and can be used for retrofit.

CoreSense™ continuously monitors hydrogen levels in transformer oil to provide an early warning for most incipient malfunctions. CoreSense™ also continuously monitors moisture. Moisture has an impact on the insulation system and potentially accelerates aging. The hydrogen and moisture reading of CoreSense™ combined with ABB’s unique experience best enables to recommend effective corrective actions.

Intelligence can be provided to individual transformers, however the highest benefits are achieved from a whole fleet of transformers, when the transformer status reports are automatically collected by a central dashboard providing a fleet health assessment.

CoreSense™ has no moving parts, it is based on an innovative thermal pump technology. It can be connected to the transformer at any location including the drain valve. The thermal pump induces the necessary oil flow by convection instead of conventional mechanical pumps, eliminating a source of failures.

ABB offers reliable online monitoring solutions across multiple industries worldwide and has an extensive installed base of sensors and analyzers. With over 100 years of experience as the leading transformer supplier, ABB has intimate knowledge of how transformers behave. Where other market players provide sensors, ABB provides Transformer Intelligence.
The modern electricity grid is a complex, intelligent mechanism that is indispensable to modern life.

Embedded sensors and intelligent devices provide grid operators with rivers of data, which ABB MicroSCADA Pro Historian’s data logging and reporting functionality now refines into valuable reports and analyses. This advanced capability effortlessly collects, archives and enables the observer to visualize and analyze the primary process data. ABB MicroSCADA Pro Historian is the tool that enables you to benefit from critical, accurate grid information. It is the way to understand what has happened, and what is happening in a power grid.

An accurate view of the primary process enables fact-based decision making.

MicroSCADA Pro Historian collects and stores various types of data in a database designed to archive hundreds of thousands of values over long time periods in an accurate and reliable way. MicroSCADA Pro Historian quickly and easily installs into existing MicroSCADA Pro systems without service interruptions. Extend your current MicroSCADA Pro system with the Historian to start gathering your data and immediately benefit from the advanced analysis possibilities. The Historian can safely be connected to a running MicroSCADA Pro system without interruption to the operation.

Intuitive, easy operation ensures full utilization of the capabilities. The flexibility of the user interface provides enterprise-wide ease of use. Various needs from high-level business summary to advanced equipment performance and detailed analysis of the electro-technical behavior are supported.

MicroSCADA Pro Historian makes measurements and trends visible and understandable. The advanced visualizations allow information to be presented in a clear way. Any user can easily compose new reports and layouts to adapt to every situation that emerges.

Between the high-voltage wires, and pressurized pipes, of a modern utility lies a second, equally important, network. Snaking fiber-optic cables connect SCADA systems that monitor and manage the product delivery, but visualising this second network requires a new breed of management tool – the SDM600.

Protection relays do the vital work of monitoring the delivery network, but ensuring they’re all updated and properly configured has become increasingly burdensome, at least until the SDM600 takes on the job of tracking versions. Using IEC 61850 interfaces the SDM600 software keeps a watchful eye on protection relays so the user can ensure they’re all running the latest software, and to the greatest effect.

SDM600 also talks to relays when collecting, and collating, fault records data. The gathered comtrade files are recorded into short reports for later analysis, while the SDM600 dashboard presents historical reports so we can see what happened and when with unprecedented ease. Authenticating users is another task which has ballooned as management networks grow in complexity, and one which SDM600 takes in its stride. Cyber security is a vital component in modern networks, but fragmented directory policies risk exposing critical vulnerabilities which SDM600 can avoid.

With centralized security logging and central account management SDM600 becomes the gatekeeper to the automation network.
Asset health is not a new concept; as a label, it merely describes the discipline of overseeing the lifecycle of the electrical equipment required for utilities to do their job. But as a business strategy, end-to-end asset health describes a specific combination of technologies, analytics and work processes that have only recently become commercially viable to bring an unparalleled level of order, automation and comprehensiveness to this function.

The first job of an end-to-end asset health system is to gather information from the widest range of sources and integrate these disparate data so it can be analyzed and converted into actionable knowledge. These include test and inspection reports, maintenance status reports and data from OT (Operations Technology) systems.

Secondly, asset health should add asset operational and performance intelligence — an embedded understanding of the equipment itself that:
- Tracks real-/near-real-time information about the current condition and performance of each asset.
- Provides analytics and dashboards so information can be contextually understood by individuals in accordance to their role and function within the utility; and supports repair and replacement decision-making.

The third function of asset health is to deliver this information in an appropriate format to whomever needs it — whether it’s to the executive suite as a dashboard of Key Performance Indicators (KPIs) or to the service technician in the field about to perform maintenance on an asset.

Finally, the most effective AHM takes full advantage of the integration to existing work management systems to generate work orders and facilitate execution of these decisions.

The complex interconnectivity of these work processes demands an enterprise-wide approach to managing asset health, which is why leading utilities are developing an end-to-end asset health strategy that combine all of the following attributes:
- Asset knowledge and expertise
- Sensors and monitors
- Communication gateways
- Data integration, archiving and storage
- Equipment performance models and algorithms
- Analytics and dashboards
- Integration to systems for asset management, supply chain management, and work management and execution.

An ARC Consulting Group survey of utilities estimates corrective maintenance can cost 10x as much as predictive maintenance. In addition, they found that approximately 65% of the time, traditional preventive maintenance often results in no action.

AEP, the largest TSO in the USA, has avoided failures using Asset Health Center’s predictive analytics. In one specific example, they saved $4 million when a transformer began to show rapid gassing (H2 and acetylene), was taken offline, and the loose leads that would have caused failure were repaired.

ABB has already completed the FMEA and root cause analysis for EHV and HV equipment and embedded this knowledge into AHC. By starting with AHC, National Grid SA could therefore quickly gain the benefits of RCM without the delay of waiting for failures to happen in their own organization.

Preventive Maintenance
An APC Consulting Group survey of utilities estimates corrective maintenance can cost 10x as much as predictive maintenance. In addition, they found that approximately 65% of the time, traditional preventive maintenance often results in no action.

Reliability Centered Maintenance (RCM)
Reliability Centered Maintenance (RCM) programs often take a very long time to show benefits if ever in the electricity transmission environment, partly because failures are not as frequent. ABB has already completed the FMEA and root cause analysis for EHV and HV equipment and embedded this knowledge into AHC. By starting with AHC, National Grid SA could therefore quickly gain the benefits of RCM without the delay of waiting for failures to happen in their own organization.
Network Manager SCADA

Network Manager SCADA is the real-time processing platform for successful management of all remote control operations of generation, transmission and distribution systems. The platform addresses the needs of electrical power networks for railways and airports to ensure safe and reliable power supplies. It is also used for multi-utility applications including gas and water networks.

The platform has high availability and performance, supporting multiple redundancies across hardware and software. With an extensive toolbox for adapting to safety procedures and work processes to ensure compliance with transportation safety regulations. Possibility to include emergency control center and backup facilities with highest available cyber security. Ensuring secure and efficient energy system operations through advanced operator support, standardized data management and high volume processing of real-time and historical data.

Network Manager SCADA supports all sizes of electrical network, with large numbers of client workplaces both mobile and stationary. Full flexibility to equip each workplace to the appropriate size and number of monitors, alarm actuators and other devices.

Benefits of Network Manager SCADA include:
- Scalable for easy expansion of data and functionality, as well as multiple redundancies
- Stable platform with high throughput even during disturbance situations
- Extensive reporting and archiving possibilities
- Cyber security built into all functions and sub-systems
- Support for multiple RTU protocols, including: IEC 60870-5-101/-104, DNP 3.0, and RP570

Transmission Management Solutions

Network Manager EMS manages transmission networks ranging from sub-transmission and regional dispatch centers to large nationwide control centers. The EMS module comprises a comprehensive set of powerful applications for analysis of network security and operation economy. By using advanced operator support, standardized data management and large data volume processing. Executing in real-time and study environments.

The system provides a complete set of advanced power system application functions. These are setup to find the optimum solution for transmission network operations in deregulated markets and for combined network and power generation operations in traditional markets.

Network data are both telemetered and calculated, building a complete network model used by the EMS network applications including forecasting, training simulation, security analysis, and playback mode.

Benefits of Network Manager EMS include:
- Secure and efficient network operation, in regulated and deregulated markets
- Improved quality of supply
- Optimal utilization of the transmission network
- ENTSO-E CGMES and CIM compliant
- Advanced visualization and situational awareness for operators, leading to enhanced grid operation
- Continuous monitoring of the network stability, minimizing the risk of widespread blackout
- High-fidelity Training Simulator for advanced operator training, under steady-state and dynamic power system conditions providing information about equipment maintenance and outages.
We may not make the world go round, but ABB’s Global Customer Care team does its part to keep it running. Through our four key pillars of focus, we provide ongoing technical and functional support to help you meet your objectives.

Rapid response
When something goes wrong, you need it fixed fast! Whether it’s spare parts, replacement equipment, or repairs, our Care agreements are tailored to your needs. Our remote services and 24/7 call center also provides quick troubleshooting and root cause analysis services so you can identify the most effective course of action and address problems before they grow.

Operational efficiency
Need to modernize or address a sticky issue? Our consultants can help you assess the challenge and design cost-effective, fit-for-future solutions. In addition, we offer a wide range of commercial and proprietary enterprise-level applications to help you improve operational efficiency.

Performance improvement
Hitting key performance targets can be tough to do when you’re trying to keep costs under control. Our team can devise solutions that help you hit your targets as well as provide software applications that deliver actionable insights for future performance improvements.

Life cycle management
Cradle to grave, Power Grids Service is there to help you take care of your assets by providing installation and commissioning services, maintenance, replacements, spare parts and consumables, and training. We can also help you extend the life of your assets with extensions, upgrades, and retrofits. When it’s time to retire an asset, we offer end-of-life services that help you do so cost-effectively and responsibly.

We are with you around the world
ABB Power Grids Service has more than 150 Customer Care centers strategically located around the globe. These one-stop-shops are staffed by 6,000 professionals with extensive industry and service experience on a wide array of power equipment and systems. Our team of power experts and analysts can help you address today’s toughest power challenges and prepare you to meet the challenges of future.
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