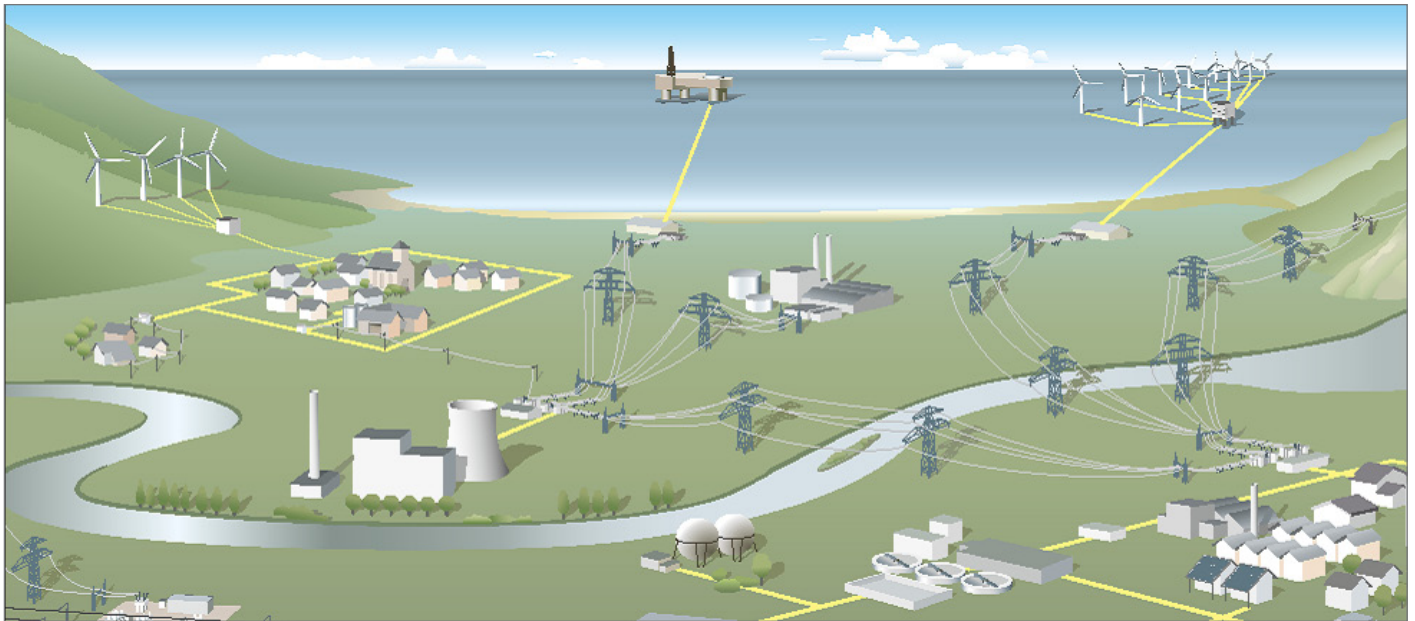# RTU560/RTU211
Solutions overview

Power and productivity
for a better world™

Your benefits at a glance

Strong partnership

ABB is working for more than 40 years with continued success in the area of remote control applications and offers the security of a strong and experienced partner. Worldwide presence with local partners in almost all regions allows quick access to support and service.

World-proven technology

With more than 50.000 installed Remote Terminal Units (RTUs) at around 2.000 customers in more than 100 countries, ABB is world market leader for medium and large RTU applications.

One solution suitable for various applications

The open architecture of the RTU supports adaptation to different applications. Future functional and quantitative extensions are easy to realize at anytime through hardware or software upgrade for various applications:
– Transmission/sub transmission
– Distribution automation
– Smart grids
– Feeder automation

Life cycle costs

Today's investment in ABB RTUs can be considered as an investment into the future. Your investment is secured through:
– Future-proof technology by incorporating modern international standards such as IEC 61850
– Open and scalable system architecture
– Retrofit concepts

Cost advantages

ABB RTUs offer significant cost saving benefits:
– Reduced operating and maintenance costs through advanced diagnostic tools
– Small number of configurable hardware components for all applications reduces spare part costs
– Integrated Human Machine Interface (HMI) functionality, PLC functions and network components in one RTU system
– Reduced engineering hours through efficient engineering tools
– One engineering tool for the complete RTU family
– One solution, from pole top RTUs to large complex transmission RTUs, with consistent system functionality

Our RTU family

Functional elements

The flexible and modular designed RTU provides a complete solution with many integrated functions. The scalability of the system allows perfect adaptation for station reinforcement, retrofit and upgrades.

– Flexible footprint: 19" rack, half size rack or DIN rail design, in combination with different communication modules, provide the perfect fit for your application
– Advanced communication: Communication racks with multi-processor architecture, integrated modems and network modules
– Scalable in- and outputs: Solutions for small feeder RTUs up to complex and large substation RTUs
– Integrated cyber security features
– Superior redundancy concept adaptable to different availability requirements
– Efficient data engineering: Easy use of MS-Excel sheets for data engineering and for data import and export
– Time synchronization
– Rugged design for substations and harsh environmental conditions
– Applicable for electrical applications from medium to extra-high voltage
– Including support of non electrical application like gas, oil, water, waste water and district heating
– Supports many modern international and third party tele-control communication protocols
– Solution using IEC 61850 station bus for new business, retrofit and/or partial upgrades

Rack

– RTU solution for huge and medium applications for transmission/sub transmission and distribution
– The swing frame and mounting plate rack expand the flexibility of the RTU560 rack based solution
– Fully flexible sub racks for communication units (CMUs) and I/Os with redundancy support
– 19" and short versions
– Sub racks for cost efficient solutions
– Wide abilities to interface with host systems and sub devices

DIN rail

– Excellent solution for smart grid applications and feeder RTUs
– Compact RTU560 DIN rail or remarkable cost-effective RTU211 DIN rail solution
– Minimized installation efforts
– Directional fault current detection (optional)
– Extendable with different I/O modules

ConBox

– Compact design for integration in ABB remote GridGuard™ three-phase, gang-operated overhead distribution switches
– The ConBox is a RTU211 based solution
– Vertical modular construction including I/O modules

Scalable for various applications
Transmission/sub transmission

Requirements
– High number of data points
– Communication to several hosts
– Multi-line host communication
– Interfaces to IEDs
– Communication to sub systems
– Redundancy and high reliability
– Support of IEC 61850
– Integrated HMI
– Local archive
– Cyber security
– Expandability

RTU560 rack solution
In order to achieve a cost efficient solution for requirements of different applications, swing frame or mounting plate rack solutions can be used. They can be realized as pure communication racks, pure I/O racks or a combination of both. Higher system availability can be achieved by using redundant power supply, redundant communication and redundant CMUs for each rack.

Classic RTU
The gathering of direct-wired process information and its transfer to a higher level control system is one of the primary tasks of the remote control application.
The RTU560 rack based solution with its scalable platform and its highly advanced communication capabilities allows ABBs RTU to communicate to various sub RTUs, IEDs and control centers at the same time.

This ensures the highest flexibility of adaptation to the customers' requests for different applications: The on-board PLC function according to IEC 61131-3 ensures that customer specific applications can be easily integrated into our system. The I/O compatibility to RTU232 and RTU200 allows cost optimized upgrades of existing ABB installations.

Substation automation/hybrid solution
In substation automation systems, the RTU has interfaces towards protection and control equipment, as well as metering devices and other automation products.
Local and remote monitoring and control can easily be achieved via the integrated Human Machine Interface of the RTU560.
The IEC 61850 client and server functionality of the RTU opens up an additional application area. It allows the combination of traditional protocols, parallel wiring and the IEC 61850 station bus. The hybrid solution provides the possibility to gradually upgrade the station to an IEC 61850 architecture.

Communication gateway
The scalable hardware platform of the RTU560 fulfills the requirements of communication gateways. The RTU uses multi-processor technology to achieve high performance in data processing. The RTU560 simplifies complex communication structures through decentralized communication gateways. Together with the flexible redundancy concept various levels of availability can be achieved according to the operational requirements.

Scalable for various applications
Distribution automation

Requirements

– Small/medium number of data points
– Host communication flexibility
– Interfaces to sub devices
– Wide range of communication media
– Cyber security
– Distribution substation RTUs in the following configurations:
    – Conventional substation RTUs
    – Decentralized bay RTUs using IEC 60870-5-104 or IEC 61850 station bus
    – Decentralized I/Os

RTU560 rack and DIN rail solution

The automation or refurbishment of distribution substations is a corner stone in most utilities programs over the next years. Small to medium number of data points and various communication structures are common in these applications. The availability of a wide variety of standard protocols to control centers, sub devices and IEDs including the possibility of easy implementation of propriety protocols results in a high flexible unit.

The demand for small RTUs is satisfied by the extension of the product portfolio with the RTU560 short rack and DIN rail RTUs.

The RTU560 short rack together with a wide range of communication interfaces e.g. fiber and copper solutions as well as radio, GPRS/UMTS etc., meets the requirements for distribution applications. The compact dimension makes it an adequate solution for applications with space restrictions. As a member of the RTU560 family, this RTU provides full functionality.

The RTU560 short rack provides 9 slots which can be equipped with communication units or I/O modules.

The RTU560 DIN rail is a single processor solution and provides similar functionality as the rack solution. Various I/O modules are available as DIN rail which can also be used for the rack solution.

The direct CT/VT interfaces (1A/5A; 110…400 VAC) of the RTU560 makes measurement transducers obsolete and broadens the application areas of the RTU560 even more.

Scalable for various applications
Smart grids
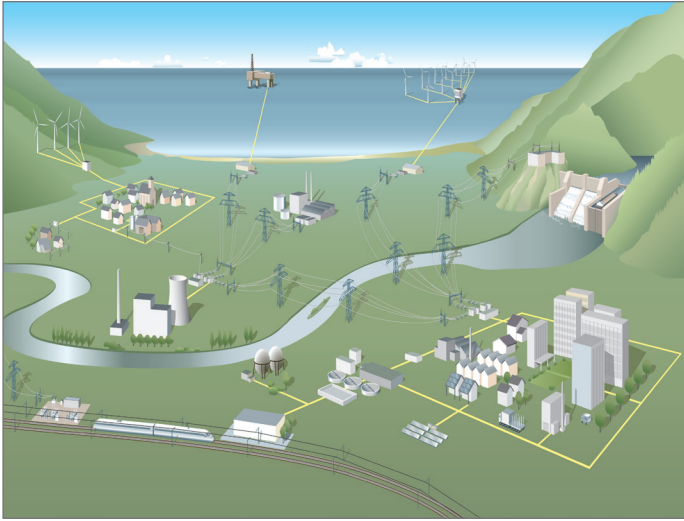
Requirements
– Increased grid complexity requires measures for automated grid stability procedures
– More real-time information
– Remote monitoring and control of decentralized generation e.g. wind, solar etc.
– Management of decentralized energy storages
– Grid operation with distributed generation
– Load management and demand response
– Real-time pricing
– Control load shedding for grid islanding purposes
– Directional fault detection, isolation and restoration
– Automatic switching sequences

RTU560 DIN rail solution
The RTU560 DIN rail provides advanced functionality and makes it the perfect fit for current and future smart grid applications. The compact housing with the possibility to integrate hardwired information fulfills complex requirements and space restrictions at the same time.

The very powerful PLC capabilities allow the integration of sophisticated automatic functions as used for load shedding and other applications.

Algorithms, switching sequences and logics can be implemented as logic building blocks. Libraries are used to make these building blocks available throughout the product family. Another enabler for smart grid is seen in the use of open standard protocols. The IEC 61850 standard is seen as a key towards the smarter grid.

Those standard protocols in combination with wireless communication and PLC capabilities are enable to provide fault detection isolation and restoration functionality.

Maintenance and service costs are kept low since RTU560 DIN rail solution is remote configurable and maintainable.

The high product quality and user friendly service capability reduce life cycle costs.

The available human machine interface functions complete the well-designed product.

Scalable for various applications
Feeder automation

Requirements
– Compact solution due to space restrictions
– Harsh environmental conditions
– Direct measurement of voltage and current
– Energy and power calculation
– Measurement functions for fault detection
– Wireless communication
– Suitable for ring main units and pole-top

RTU211 DIN rail solution
The RTU211 DIN rail is suitable for small solutions with space restrictions such as pole-top RTU, capacitor banks and ring main units. With its scalable housing depending on the necessity of the I/O amount it is a solution with flexible integrated I/Os. This compact solution provides serial and Ethernet interfaces for communication with control centers and IEDs. The RTU211 provides interfaces to various communication concepts. Wireless communication can be achieved via radio or GSM/GPRS. The integrated PPP capabilities of the RTU allows to use low cost modems. Direct CT/VT interfaces can be used to collect measurement values without the use of transducers.

The RTU211 is integrated into the engineering environment of the RTU560 and presents the most cost efficient solution of the RTU560/211 product family.

RTU211 ConBox solution
The ConBox is ABBs space and cost efficient solution designed for integration in ABB remote GridGuard™ three-phase, gang-operated overhead distribution switches. The target of this RTU211 product is to utilize the limited space in the existing control box of the switch. Concurrently the ConBox keeps the configuration flexibility for the adequate adaptation to the respective solution. The modular construction allows a flexible adaptation of I/O modules.

Flexible system concept
Communication
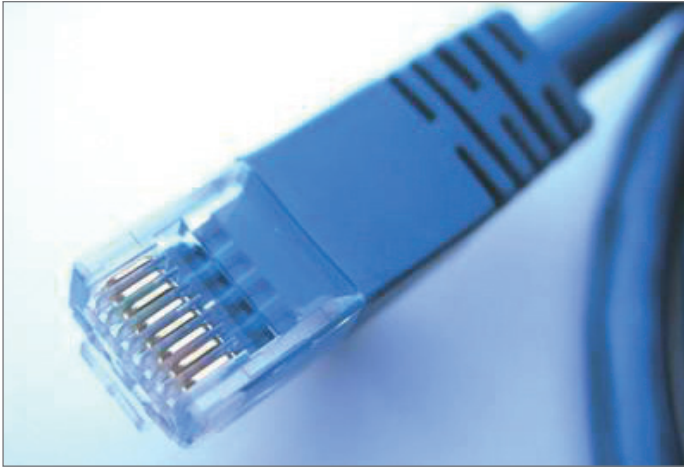
Network interfaces
The RTU supports integrated serial and Ethernet communication interfaces. The number of communication interfaces can be adapted according to the project requirements by using appropriate type and number of CMUs.

Communication modules
In order to achieve the flexibility for communication with the variety of devices, the RTU560 has an available spectrum of communication modules for integrated RTU rack or DIN rail solution. These are CCITT/V.23 and 9600 baud analogue modems, Fiber optic converters, managed and unmanaged Ethernet Switches, DSL modems and fiber optical converters (Mono- and Multi-mode).
Stations with up to 20km distance can be interconnected via the SDSL ports.
With the 2 DSL interfaces the managed switch is able to provide redundant topologies (loop configuration) which makes an electrical ring connection of IEDs/RTUs achievable. This network can be used for other services e.g. voice of IP, maintenance/diagnosis.
Wireless and wired communication can additionally be realized via third party communication devices e.g. radio modems, multiplexers, dial-up modems and GSM/GPRS modems via PPP.

Host communication
The RTU allows communication with up to 16 host systems via different protocols. System events are used for supervision of host connection.
The standard protocols which are supported from the RTU are:
– IEC 60870-5-101/-104
– DNP3, serial and TCP/IP
– Modbus serial and TCP/IP
– Other specific protocols such as Indactic 33/35, RP570/71

Additional third party/country specific protocols are available (e.g. Telegyr TG800, Sinaut 8FW, Conitel 300, Estel, Harris5000/6000, Hitachi etc.).

Sub device communication
Up to 150 IEDs can be connected to one RTU. Each connected device is supervised by the system diagnosis of the RTU.
The standard protocols which are supported by the RTU are:
– IEC 60870-5-101/-102/-103/-104
– IEC 61850-8-1
– DNP 3.0 serial and TCP/IP
– Modbus serial and TCP/IP
– Meter interfaces
– Other specific protocols as RP570/71, SPA bus, etc.

Additional country or supplier specific protocols are available on request.

IEC 61850 station bus applications
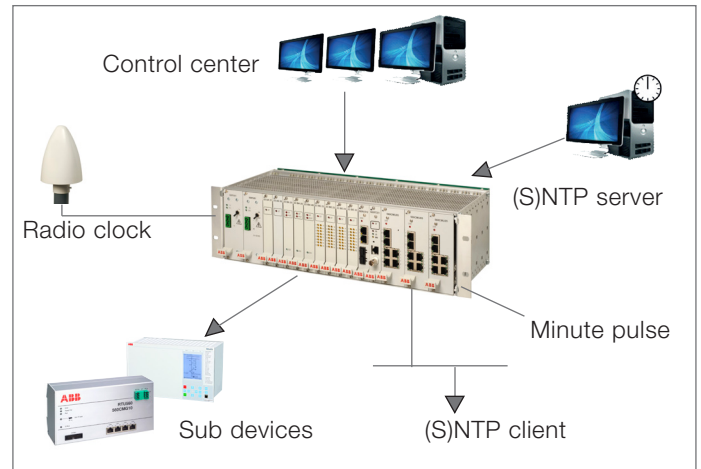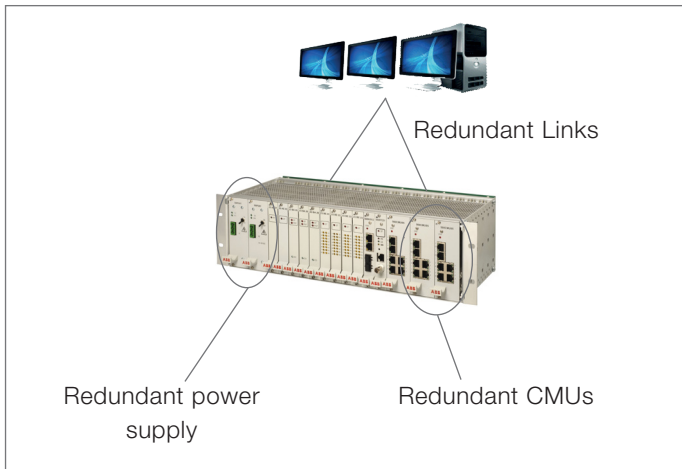IEC 61850 client (gateway)
enables the communication between the IEC 61850 station bus and network control centers.

IEC 61850 server (IED)
is used to integrate existing I/Os and/or non IEC 61850 sub devices to the IEC 61850 station bus. The RTU560 can be used as field device since it supports GOOSE. Therefore data exchange with other IEC 61850 devices is possible.

Flexible system concept
Redundancy and time management

Redundant Links

Redundant power supply

Redundant CMUs

Control center

Radio clock

(S)NTP server

Minute pulse

Sub devices

(S)NTP client

Flexible redundancy concepts

For energy transmission and distribution networks it is important to maintain access to the stations. The RTU560 manages this requirement by providing a sophisticated redundancy concept offering the following features:

Redundant power supply
With the enhancement of the rack portfolio, redundant power supply modules are possible for all kinds of racks.
The power supply modules are supervised by the watchdog of the RTU560. In case of a failure, they can be replaced during operation. DIN rail power supply units can be used in parallel mode.

Redundant communication links
The communication via two communication lines and networks in parallel is available as multi-master communication for all protocols.
Redundant serial communication is possible for IEC 60870-5-101. Redundant network communication is available for IEC 60870-5-104.

Redundant communication units
The redundant CMU pairs supervise each other. In case of a failure the switch over is initialized automatically.
In one RTU system redundant and non-redundant CMUs can be combined. For fire protection the redundant CMUs could be spread out across separate racks in different rooms.
The modular architecture of the RTU560 make it possible to use parts or combination of all three redundancy elements.

Time management concept

The accuracy and resolution of the time stamp for a process event is important for analysing network disturbance, especially when analyzing events from and between different stations. The RTU560 internal time management is controlled by the CMU communication boards. The time resolution of the RTU560 is 1 ms for events. The RTU560 supports different synchronization modes:
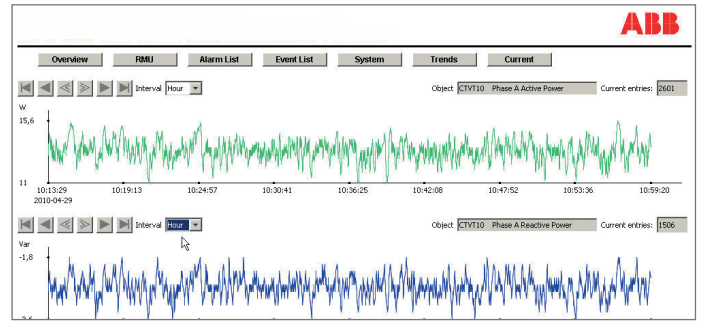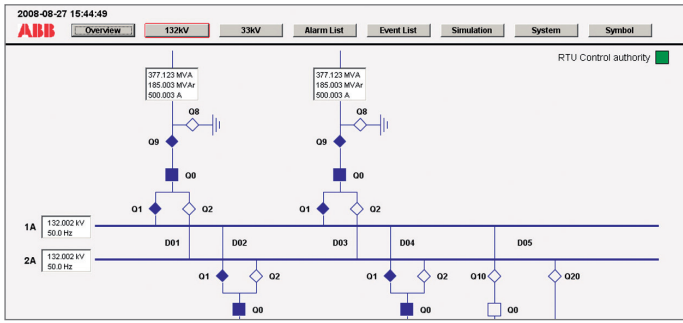– Serial protocols (e.g. DNP3, IEC 60870-5-101)
– TCP/IP based (S)NTP network, DNP3.0 or IEC 60870-5-104
– Real-time clock (GPS, DCF77 and IRIG-B)
– External minute pulse

The RTU560 can synchronize additional sub devices like RTUs and IEDs via:
– Serial protocols (e.g. DNP3, IEC 60870-5-101)
– TCP/IP based (S)NTP network, DNP3.0 or IEC 60870-5-104
– External minute pulse

The RTU560 supports different time zones and several redundant timer servers.
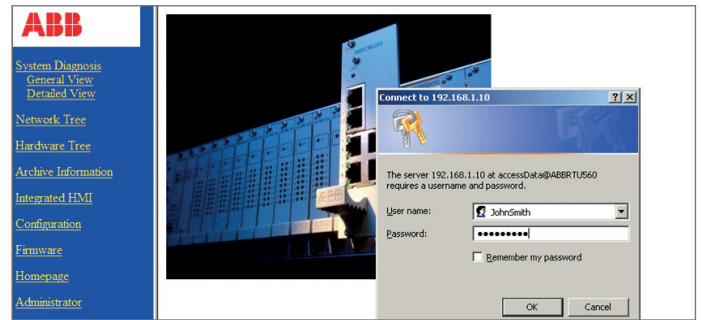
Technical highlights of the RTU family

Integrated Human Machine Interface

The HMI, which is integrated in the RTU, provides easy station monitoring and control based on web server technology. This solution simplifies the data engineering.

The HMI functions supported by the RTU560 for station visualization and control provide static and dynamic components, events and alarm list, system events and trend charts. Own symbols can be defined in order to visualize the station in a flexible way.

Engineering

The data engineering of the RTU can easily be carried out with the Windows based tool RTUtil560. RTUtil560 supports the complete RTU560/211 platform. The engineering principle complies with IEC 61346-1 standard. MS-Excel is used for process signal engineering and mapping as well as for data import and export to and from other systems. Debugging functions like consistency checks are integrated into RTUtil560.

Configuration data can be transferred to the RTU via network or protocol transfer functions (e.g. IEC 60870-5-101/-104 and DNP3).

MULTIPROG® wt is used to create PLC programs and is based on Windows technology. The PLC function fully complies with IEC 61131-3 standard and supports 5 programming languages. Online debugging is supported locally or remotely via TCP/IP network.

IEC 61850 engineering for client and server as well as for station bus configuration is made with RTUtil560 and

RTUtil61850.

Data point mapping of IEC 61850 and RTU signals can be achieved with these tools. Additionally, GOOSE can be engineered for horizontal communication.

Data archive and diagnostics

The RTU provides archive functions on non-volatile compact flash for events, measurements, counter values, security events, disturbance files of protection relays and load profiles of metering devices.

Disturbance files can be uploaded via IEC 60870-5-103, SPA bus and IEC 61850 and stored in the RTU.

The information of the archives are accessible via web server functionality and file transfer (e.g. with IEC 60870-5-101 and DNP3).

All information accessible via web server are protected by the user required access rights.

Cyber security

ABB anticipates the security challenges and adapts its systems constantly to the latest developments in security. Our RTUs respond to the need of the power industries and assure a high level of cyber security. The RTU supports various security features like: User access control, security logging/audit trail, https access, customer specific password policies and support of external syslog and arcsight systems. Each RTU product is exposed to extensive robustness tests before release. The security functions are implemented according to NERC/CIP and IEEE 1686.

Trends in remote control
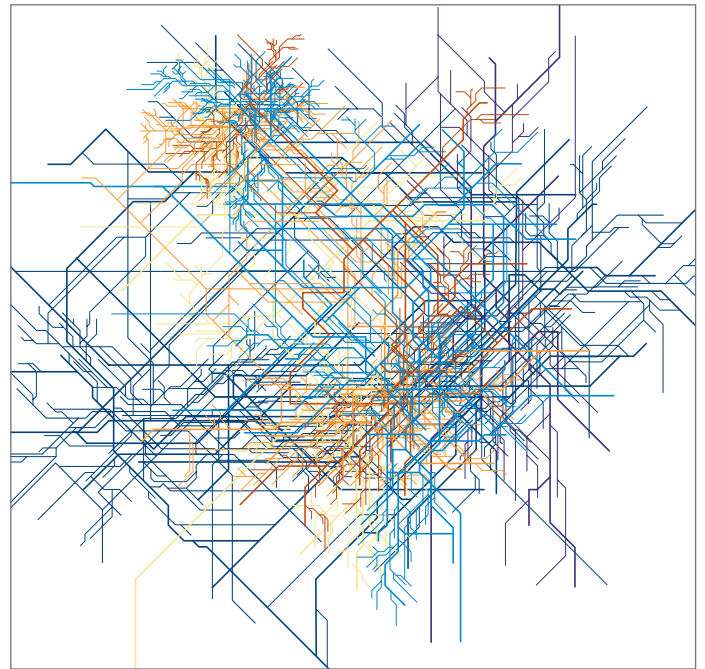
Transmission and distribution networks are subject to constant change resulting in complex structures for grid systems. Grids of the future will be different. They will accommodate all types and sizes of decentralized generation technologies (particularly renewable) and also be automatically responsive to changes in supply and demand. The beginning was done by today's deregulated market. Its requirements put extreme economical pressure on network operations expecting the monitoring and controlling of the grid down to the lowest level.

The smart grid will minimize the environmental footprint, be self-monitoring and provide real-time information to help manage distribution and power generation. The need for more information from the grid in the lower voltage levels requires a higher deployment of intelligent technologies to gather this information. Remote control meets these requirements with a wide range of functions as well as flexible and modern communication technologies.

All of these elements, from the economical to the environmental, are amplifying the necessity for the grid itself to evolve. A solution based on remote control still represents the most economical alternative. It offers the possibility of station automation, modernization and extension with highest functionality and availability.

Constant change of technology

Smart meters

The large deployment of smart meters and its required communication infrastructure open the possibility to apply smart meters for the operation of the grid. Traditionally energy metering and network control have been separated. Its integration provides several opportunities of optimization, e.g. the usage of the same communication infrastructure to use meter data for grid optimization and control.

Process bus IEC 61850

The wide acceptance of the IEC 61850 station bus in the industry points the direction towards the future. IEC 61850 will be deployed towards the process bus. Primary equipment will be enabled with even more intelligent technology and provide TCP/IP based process information. Secondary equipment will be interfaced directly to the IEC 61850 process bus.

E-mobility

E-mobility projects are constantly announced throughout the world. Consequently the impact towards grid operation is inescapable. The management of the charging stations, the demand management and the energy storage will be a future task of the grid operation. Providing technology for monitoring and control of the charging stations poses technical and economical challenges to the grid operators and technology provider.

Automated grid balancing

In the future the grid needs to be operated closer to its limits since decentralized generation creates local bottle necks in the distribution. Grid enforcements will not be possible due to environmental and economic reasons.

Grid automation is inevitable as operators and service technicians have larger areas to deal with. Therefore a higher degree of automated actions is required to ensure grid stability. The automation of these actions in a peer to peer architecture is necessary to unburden the operators and unload communication networks.

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Power and productivity
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