
ABB Ability™ System 800xA® Electrical Control

It's all about plant availability





Take control of your power

The process draws what power it needs according to operational setpoints from the process automation system, while the electrical control system strives to meet those requirements in a safe, reliable way. This makes electrical energy the most important input to process manufacturing operations after raw materials.

Take control of your electrical system

Every process industry has a sub-station that provides the necessary energy. ABB Ability™ System 800xA Electrical Control monitors and controls the substations in an industrial facility and ensures full availability with real-time applications. Users can control a process, manage a field crew and deliver outstanding operational efficiency with a single system.

There are three main benefits with an electrical control system:

Improved availability and safety

Complete substation information brought to the control room enables proactive action and appropriate decision making. Trouble-shooting is faster through remote maintenance and creates a safer environment, removing people from electrical danger and increasing overall plant availability.

Energy efficiency

Integrated electrical control permits plant operators to see and understand power usage in a more coordinated manner, allowing new energy-saving opportunities to be explored and existing reduction programs to be enhanced.

Reduced costs

Communication capabilities are important to meet the needs of the substation automation applications for interoperability between devices. Significant savings can be achieved through reduced hard-wired cabling on switchgear by connecting to intelligent devices. Simpler installations and reduced automation system are easier to engineer and maintain. Asset management strategies can be extended to electrical equipment, reduce plant downtime and improve production.

Monitoring and controlling the power is just as important as monitoring and controlling any significant process automation parameter.

Enhanced plant availability and safety

With added visibility into electrical equipment and access to historical data, routine preventive maintenance measures give way to predictive, condition-based activities that take into account the status of both process and electrical assets. When equipment needs attention, easy access to more complete information means faster trouble shooting.

The true value of a well-functioning electrical control system is measured in concrete economic gains. For industries whose wellbeing depends on producing around the clock, 24/7 availability and reliable electrical supply are vital.

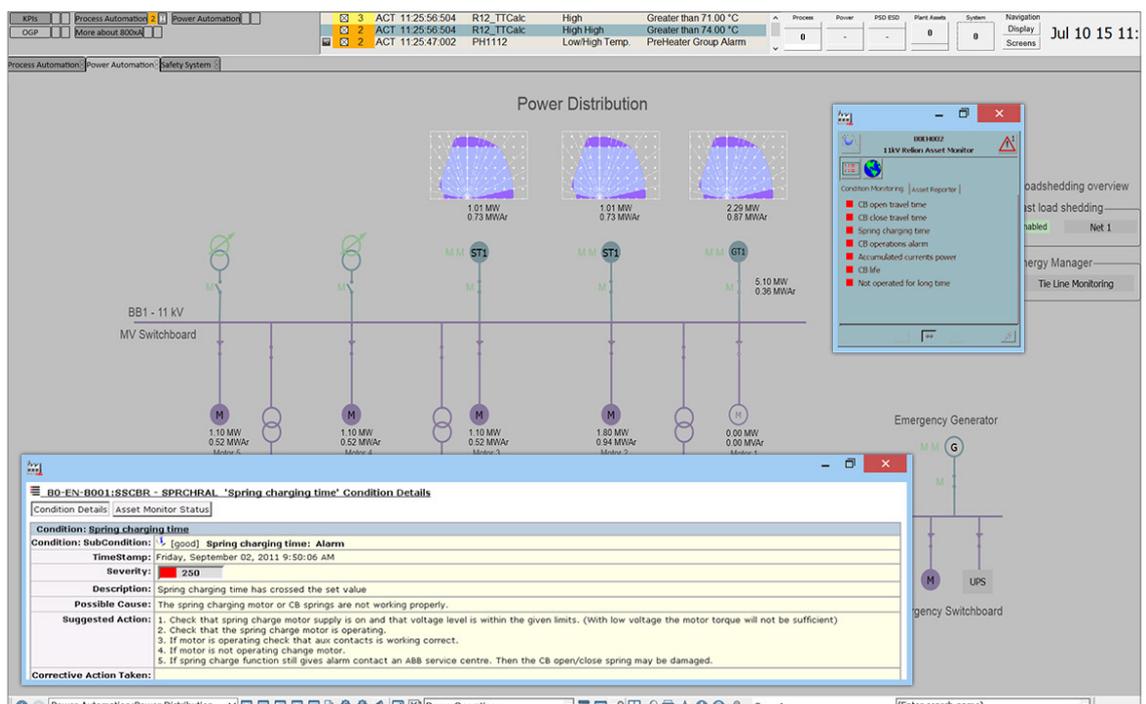
Improved visibility and collaboration across operations, power and maintenance organizations add up to higher plant availability, optimized control strategies and procedures that leverage both real-time process and electrical data.

Predictive maintenance

Knowing the status of critical assets such as motors and generators tells users what needs maintenance and, just as important, what doesn't. This is necessary for reducing maintenance costs and improving availability. Relevant information has to be available at the right time, in the right form, and to the right people.

With System 800xA's Asset Optimization, maintenance engineers, process control operators, and power engineers enjoy actionable data that they can proactively use to predict equipment failure and prevent plant upsets. For example, if a circuit breaker is taking too long to open, an alert is automatically generated and sent to the appropriate person for action. With an integrated CMMS (Computerized Maintenance Management System), a work order is generated, streamlining the maintenance work flow up to 25% by reducing paperwork and administration effort. Predicting a problem before it occurs is the best maintenance strategy.

System 800xA condition monitoring for electrical equipment with fast navigation and information access.



“In a stress situation, for example, power failure on an incoming cable, we can go into the automation system and reconnect the entire 6.35-kV switchgear from pre-programmed sequences,” [...] “We know what needs to be done and then the system knows the order in which it will happen. No need to run in front of the cabinets and control the switches.” — Arne Jönsson, electrical manager at Kemira Kemi

Remote monitoring increase safety

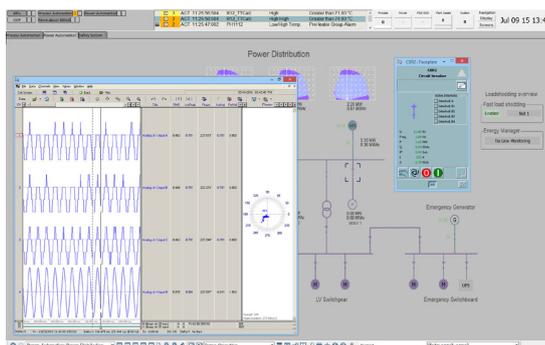
Industrial plant owners cannot afford to underestimate the need for increased safety. The substation itself poses many inherent dangers. The purpose of a substation is to step-down high-voltage to medium-voltage usable power for the plant. Employees working on switchgear in this environment are in danger of arc-flash incidents, explosions, and other hazards. Most accidents and injuries occur during routine maintenance.

With remote-monitoring capabilities plant technicians can perform more predictive and preventive maintenance tasks without entering the substation.

This reduces the work in contact with the switchgear and improves employee safety. System 800xA Electrical Control consolidates information about the plant operations and the substation in one, combined view.

The system identifies when faults occur and classifies them based on severity. The maintenance technician has access to the disturbance record file of all the protection relays in a single location, enabling precise verification and analysis. The technician can remotely take the appropriate actions to address the issue, while informing plant personnel of the hazards through the maintenance workstation.

System 800xA enables efficient operations during abnormal situations. Disturbance record available one right click away.



Change parameterization for all protection relays through the web interface directly from system 800xA.

The screenshot shows the 'Events' window in the ABB System 800xA interface. The window displays a table of disturbance records with the following columns: Time, Device, Object, and Event. The table contains multiple rows of data, including events related to 'POSITION', 'ALARM', and 'UNLOCK_REL'.

Time	Device	Object	Event
10.05.2010 15:27:38.721	CBXC8R1	POSITION	open
10.05.2010 15:27:39.051	TCSC8R2	ALARM	True
10.05.2010 15:27:36.951	TCSC8R1	ALARM	True
10.05.2010 15:27:36.950	CBXC8R1	POSITION	closed
10.05.2010 15:27:34.141	DARNEC1	UNLOCK_REL	True
10.05.2010 15:27:34.141	DARNEC1	LOCKED	True
10.05.2010 15:25:30.277	CBXC8R1	POSITION	open
10.05.2010 15:27:30.876	DARNEC1	UNLOCK_REL	True
10.05.2010 15:27:30.876	DARNEC1	LOCKED	True
10.05.2010 15:25:31.859	TCSC8R2	ALARM	True
10.05.2010 15:25:31.859	TCSC8R1	ALARM	True
10.05.2010 15:25:28.858	CBXC8R1	POSITION	closed
10.05.2010 15:25:27.987	DARNEC1	UNLOCK_REL	True
10.05.2010 15:25:27.987	DARNEC1	LOCKED	True
10.05.2010 15:24:45.194	CBXC8R1	ENR_CLOSE	True
10.05.2010 15:23:47.616	EDSKSW11	POSITION	open
10.05.2010 15:23:46.815	EDSKSW11	POSITION	closed
10.05.2010 15:23:19.320	EDSKSW11	POSITION	open
10.05.2010 15:23:02.142	EDSKSW11	POSITION	closed
10.05.2010 15:07:46.148	CBXC8R1	POSITION	open
10.05.2010 15:07:41.960	TCSC8R2	ALARM	True
10.05.2010 15:07:41.960	TCSC8R1	ALARM	True
10.05.2010 15:07:38.961	CBXC8R1	POSITION	closed

Integrated history database for optimal fault tracking

System 800xA Electrical Control synchronizes and timestamps all information from the plant's electrical subsystem and process system. Time-stamping of process events to this same network clock means that operators and engineers no longer need to try to compare unsynchronized event lists to answer the question of exactly what happened, when, and in what order. Troubleshooting, error analysis and response to plant upsets happen more quickly and easily.

Collaborative environment for more informed decisions

In addition to providing an extended and more textured view of a plant's maintenance needs, System 800xA brings together process operators and electrical power specialists. Together, with a unified set of visualization and system management tools, they can better understand the interdependencies between process and power subsystems and can make better informed, big-picture decisions.

Improved power control

The primary objective of a power management system is to avoid blackouts in industrial plants, especially those with in-house generation, critical loads or unpredictable, insufficient supply from the external grid.

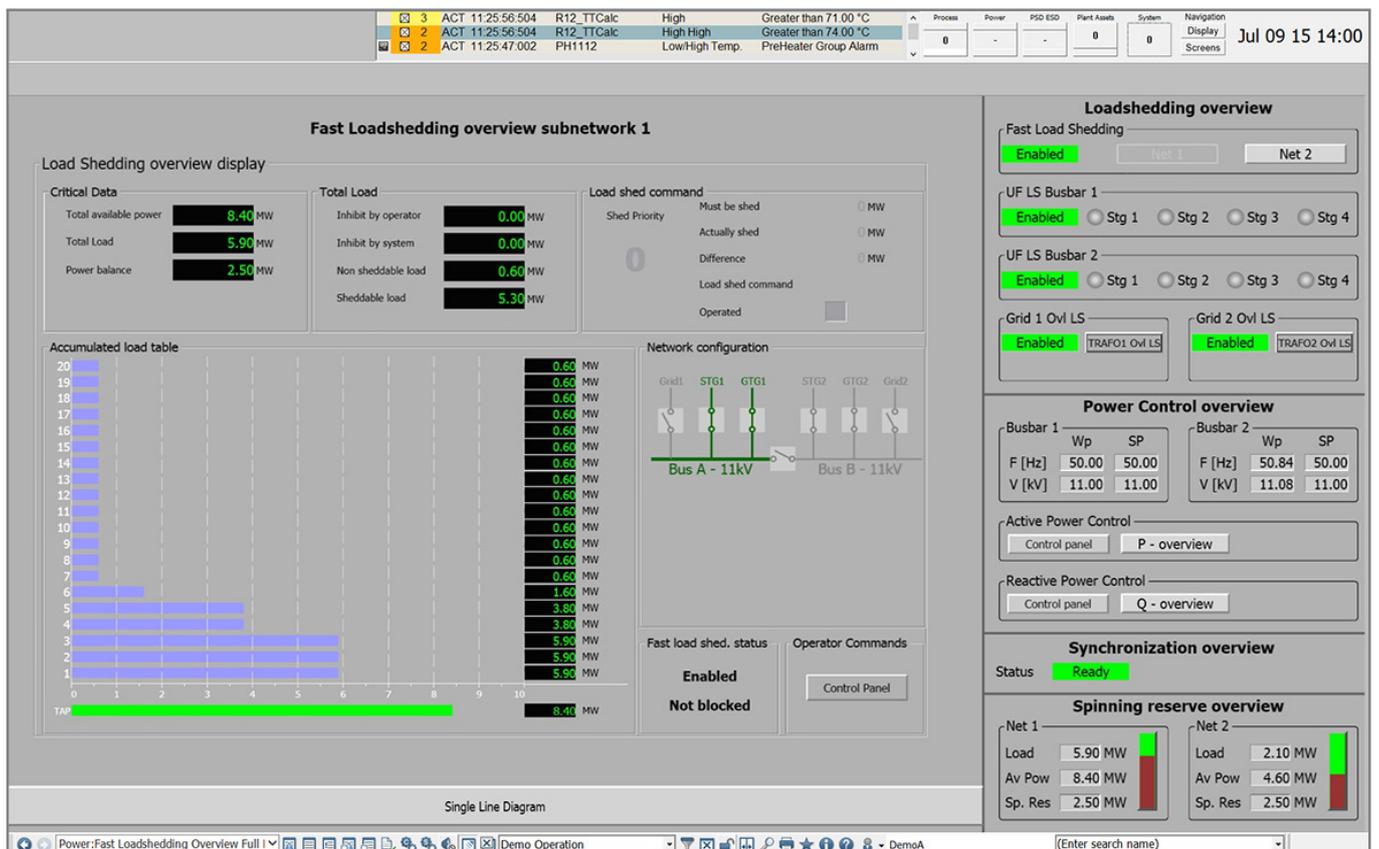


System 800xA Electrical Control offers detailed, real-time information on power consumption down to the individual loads and secures a reliable and steady electrical power supply. The system prevents blackouts and disturbances of your operations – while controlling energy costs, enhancing safety and mitigating both environmental and health impacts.

Increase plant reliability with power management
System 800xA is widely used as an integrated or stand-alone Power Management System (PMS).

System 800xA power management solutions include:

- Power control - control of power generation from several in-plant generators and power sharing with other grids and/or plants.
- Load-shedding - keeping critical loads running during limited in-plant generation (e.g. a generator trip) and/or insufficient grid supply.
- Synchronization - phase synchronization to other plants and/or grids and bus-tie operations.



System 800xA power management solution: Load shedding to prevent blackouts.

One of the most important functionalities of a power management system is load-shedding; keeping critical loads running if incoming power should be lost. Non-critical loads are shed to keep critical parts of the plant running.

Load-shedding can also help to avoid exceeding peak consumption thresholds, strategically ramping back consumption in non-critical areas to avoid punitive surcharges.

Load-shedding applications are now easier to design and can have an even faster response time compared to hard-wired solutions. Using IEC 61850 together with System 800xA, the

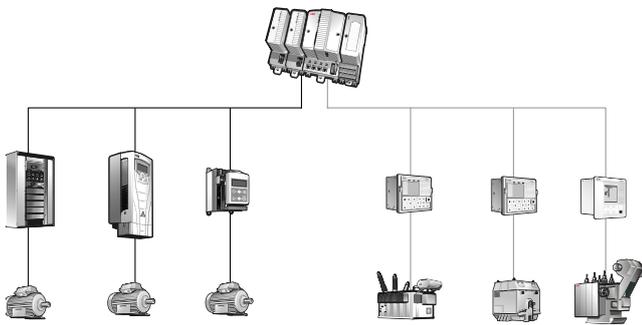
AC 800M controller acts as an IED with very powerful performance, allowing it to communicate horizontally with other IEDs via IEC 61850 highspeed GOOSE messaging (Generic Object-Oriented Substation Event). With GOOSE, load-shedding can be implemented using an Ethernet-based solution, which means faster trips, monitoring of trip data quality and reconfiguration of trip logic without re-wiring.

By using IEC 61850 GOOSE in the AC 800M controller, users can respond more quickly to power glitches, resulting in an increase in plant uptime.

It's all about Electrical Control

Choose the solution that fits your need

AC 800M only



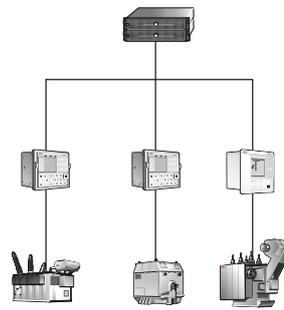
Functionalities

- Essential operation and supervision*
- No IEC61850 Connect Server
- Power Management applications: load shedding; active and reactive power control; busbar synchronization.

Benefits

- Reduced electrical infrastructure costs
- Centralized engineering
- Suitable solution for small projects or small substations
- Broad communication capabilities for optimized control

Electrical SCADA System



Additional functionalities

- Alarm and events with SoE (Sequence of Events)
- Remote maintenance and parameterization
- Automatic upload of disturbance record files

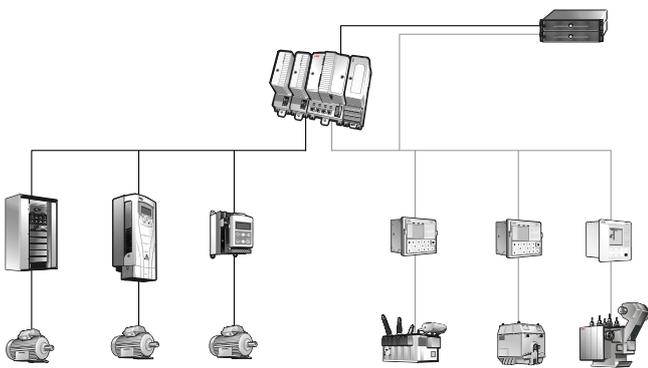
Additional benefits

- Increased availability through predictive maintenance
- Increased safety for maintenance people
- Efficient trouble shooting
- Reduced automation infrastructure cost – no controller needed**

* Horizontal communication to IEDs via GOOSE and Vertical communication via MMS for standard data objects and SoE for breaker and switch commands.

** No Power Management applications possible without AC 800M controller.

Power Management with integrated electrical SCADA



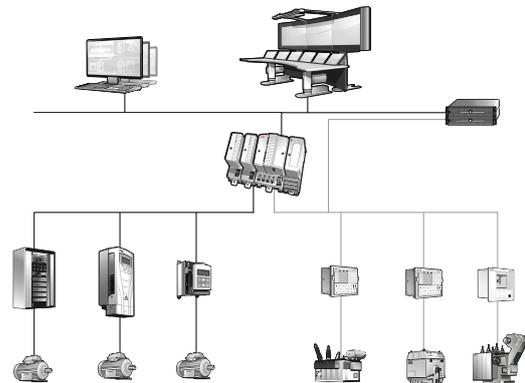
Additional functionalities

- Power Management applications: load shedding; active and reactive power control; busbar synchronization
- Remote operation and supervision
- Remote maintenance and parameterization

Additional benefits

- Reduced installation cost for load shedding applications using IEC61850
- Increase availability through blackout prevention
- Better energy distribution throughout the complete plant

Integrated electrical system in DCS



Additional functionalities

- Total plant visualization
- Centralized operation and maintenance platform for both process and electrical control
- Possibility to combine production data with energy consumption in every level of the plant

Additional benefits

- Cost effective system footprint
- Procurement and installation of only one system
- Reduced engineering and commissioning time
- Reduced project and integration risks
- Energy efficient operations
- Services (engineering): savings on reusing Process documents and system configuration; less cabinets to design and test

Let your system take control of your energy efficiency

Energy efficiency can't be ignored in today's industry. For companies, energy costs have become a decisive factor when it comes to cost-efficient production. There are great opportunities for industries to cut their electricity costs and boost their competitiveness.



One of the most important steps to getting an Energy Management program in place is measurement and analysis of the plant's energy flow. ABB Ability™ System 800xA offers a complete overview of process and power automation areas such as process instrumentation, process electrification, substation automation, and power management.

A complete picture of energy usage

In the past, there has been a strong focus on motors and variable speed drives solutions intended to reduce energy consumption. These types of measures often address a few high energy consumers in a plant. When implementing Energy Management programs, the main focus is often

continuous improvements over time and in this context, the automation system plays an important role.

ABB Ability™ System 800xA creates a platform where energy related data is measured, logged and can be analyzed. This gives an understanding of the electrical energy flows and load situations and also allows for the identification of equipment that does not need to be running. Monitoring the quality of the electrical power saves equipment wear and ensures compliance with grid contracts. Additionally, integration with low and medium voltage enables internal plant energy billing, a growing trend seen on larger industry sites.

System 800xA integrated approach for energy efficiency

Industries today have process control systems to control and supervise the main process and different utility systems including air, steam and cooling/heating water. In addition, most sites most often operate a substation automation system where electrical energy is controlled and measured.

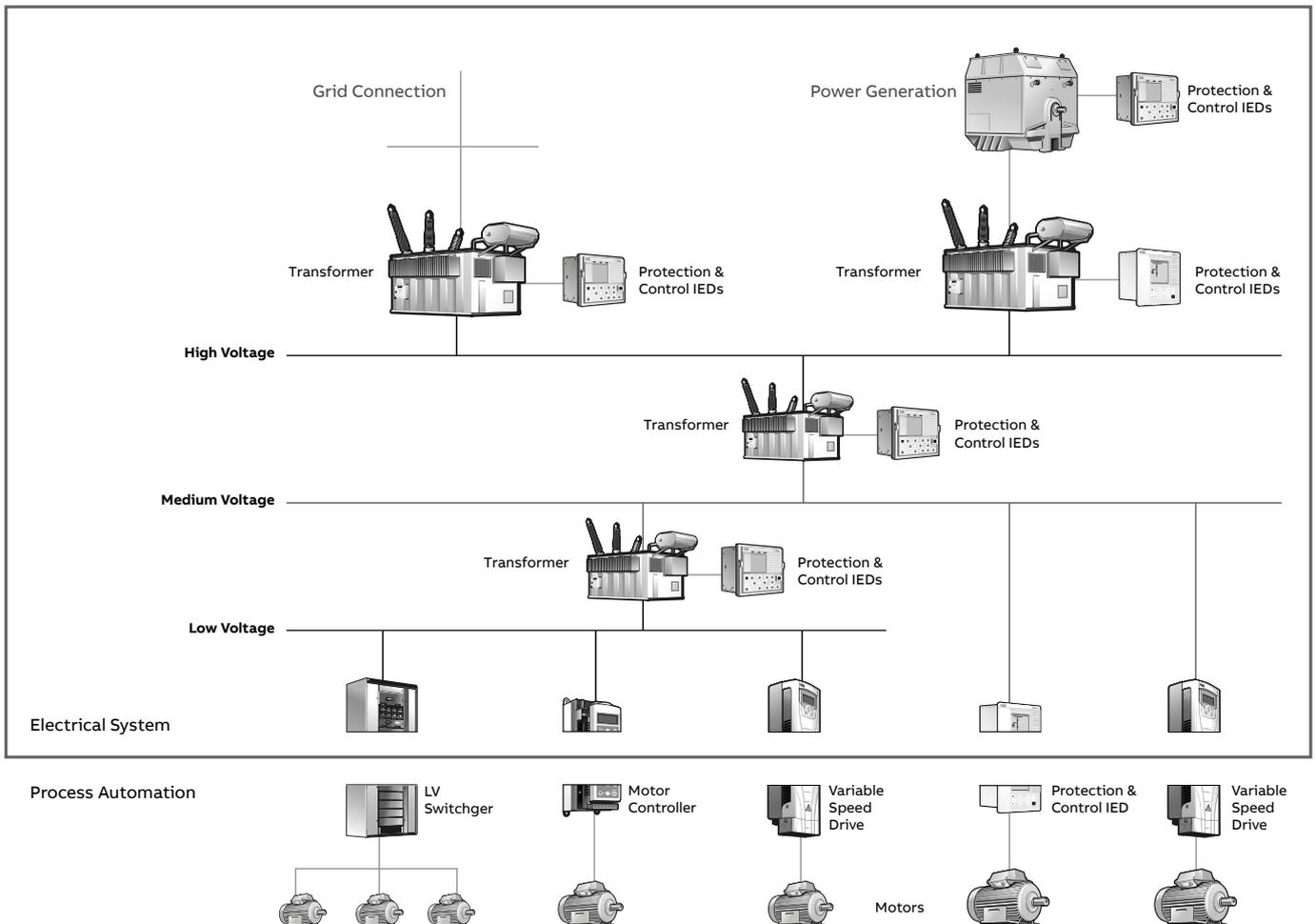
An integrated system enables operators to understand and easily access power usage. New energy saving opportunities can be explored, while existing energy reduction programs can be enhanced. For example, an increase in power consumption by a unit or an area can indicate equipment malfunction and wear. ABB believes that in many cases, the potential energy savings can equal 10% of the total consumption.

direct correlation with plant profitability than does overall production rate. Energy consumption visibility, enabled by the integrated approach of System 800xA Electrical Control, is making this possible.

System 800xA supports all major communication protocols which allows several ways to integrate both power distribution switchgear and intelligent low voltage equipment. More accurate and effective operations and monitoring of equipment like motors, drives, switchgears contributes to savings on energy costs. These integration capabilities together with the 800xA Personalized Workplace concept give plant owners a dedicated workplace with one single view to analyze the plant electrical energy flows and, more importantly, work on potential solutions for energy savings.

A complete energy management system must consider not only the power distribution part (generators, transformers, circuit breakers) but also the power consumers (motors)

The importance of energy as a process input has redefined the industrial operations' key performance indicators (KPIs) in terms of unit energy consumption, rather than overall production rate: in tons of product per kWh rather than in tons of product per day or year. This KPI has a more



Interoperability and flexible architecture

With wide communication capabilities



Electrical control systems have been hampered by a lack of communication standards and challenging architectural design resulting in high project execution, commissioning and life-cycle costs. System 800xA Electrical Control fully supports the IEC 61850 standard of substation automation for interoperability between devices, an open and flexible architecture, and a future-proof solution based on state-of-the-art communication technology.

IEC 61850 has a standard data modeling and naming convention for IEDs, and a common language to configure the devices, thereby providing interoperability between devices. The standard has a flexible and open architecture, enabling freedom in configuring the IEDs according to application needs.

IEC 61850 standard specifies two main types of communication; vertical communication between the control system and the IEDs based on MMS (Manufacturing Message Specification), and horizontal communication from IED to IED based on GOOSE (Generic Object Oriented Substation Event). GOOSE is intended for high-priority data to be shared between the IEDs, replacing the traditionally hard-wired signals. System 800xA Electrical Control handle IEDs both with vertical and horizontal integration.

“IEC 61850 is something we’ve included in our requirement specifications for a long time and now ABB was able to deliver”, says Assar Svensson at E.ON.

Vertical communication using MMS

Vertical integration is implemented via an IEC 61850 Connectivity server transferring MMS data from the IEDs to System 800xA in the form of regular OPC data items. This gives 800xA direct access to all selected IED data such as current and voltage measurements as well as time-stamped alarms and events. Monitoring circuit breakers or other equipment and sending open and close commands to the IEDs can be done both from IEC 61850 Connectivity Server and from AC 800M controller.

All System 800xA display capabilities like freely-configurable graphics, faceplates and historian capabilities, are available.

Furthermore, IED parameterization and reading of IED condition monitoring can be done from 800xA, as well as downloadable disturbance files for error analysis.

Horizontal communication using GOOSE

Horizontal integration is implemented by simply equipping System 800xA's AC 800M controller with an IEC 61850 interface board. It communicates with all IEDs on the same IEC 61850 network in real-time using GOOSE communication.

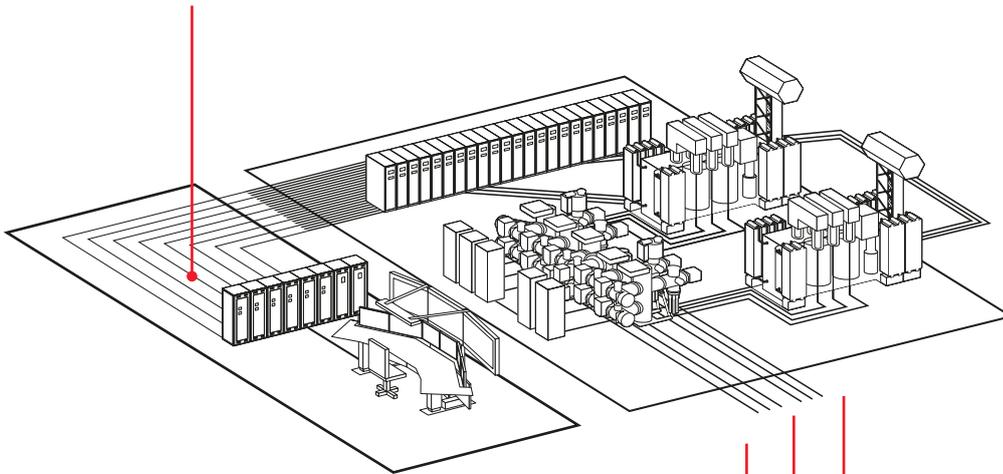
GOOSE ensures fast, time-critical data transfer and can therefore communicate critical status and maintenance information between the AC 800M and the IEDs such as load-shedding during a power outage, interlocking and even analog values.

Broad communication capabilities for optimized control

System 800xA also supports Fieldbus technologies such as PROFINET and PROFIBUS for process electrification devices like low voltage switchgear, variable speed drives and motor controllers. 800xA has extensive integration with PROFIBUS for efficient engineering and maintenance. With PROFINET, which has a wider bandwidth than PROFIBUS, even more advanced integration of process electrification is available. In addition, 800xA has extensive integration with HART, Modbus and Foundation Fieldbus for efficient process control and asset optimization.

IED vs Hardwired

With Electrical Control from ABB, you can eliminate hardwired communication and complex software gateways with an Ethernet based communication solution.



250

km of cable savings

The distance between Paris and Brussel



42%

less man hours

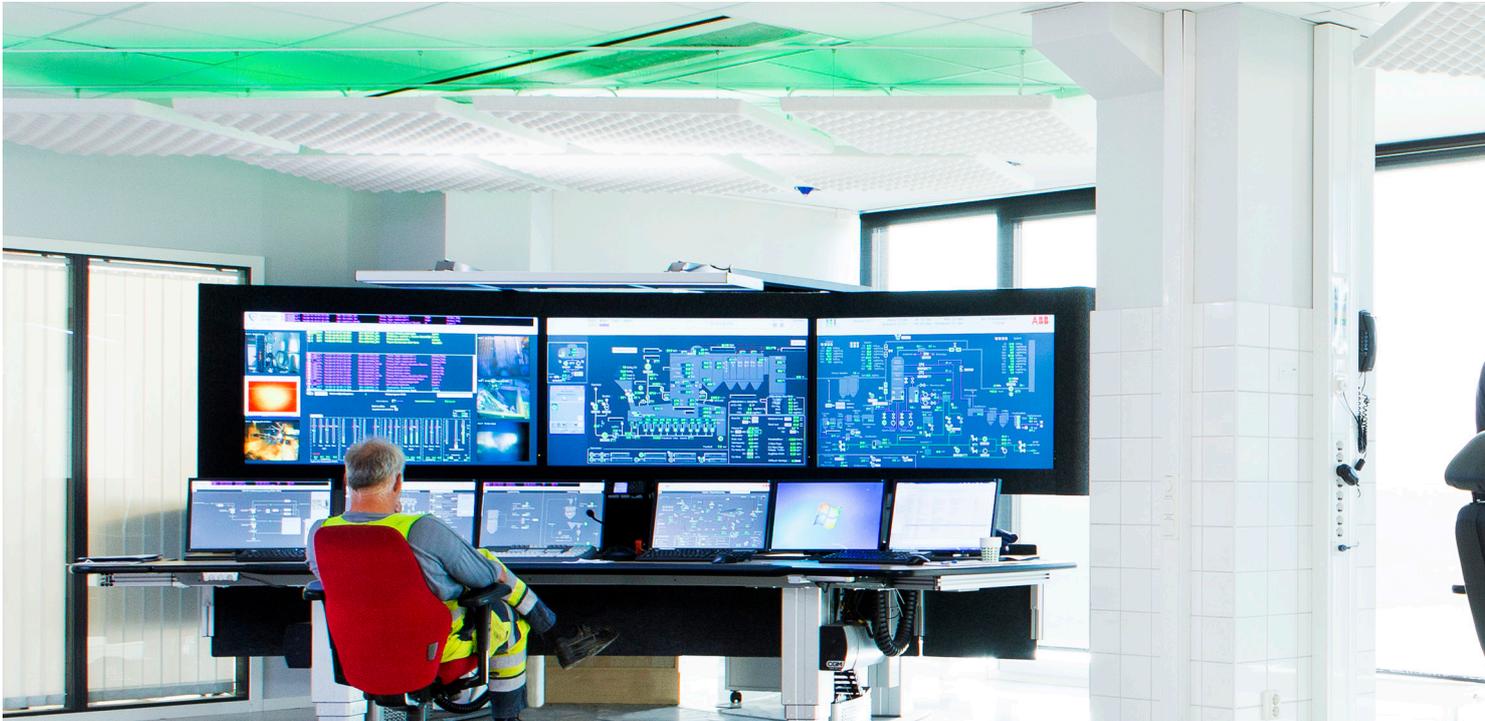


\$1,000,000

Total cost savings

—
Calculations based on a plant with 5 substations, 120 IEDs Medium Voltage, 1200 Low Voltage motors and 100 Low Voltage drives.

Coordinate and collaborate



“Installation work goes faster since significantly less wiring is required. Reduced cabling also means that sources of faults in a plant are reduced. Another plus is that the fire-load density decreases.”

— Assar Svensson at E.ON.

With integrated electrical systems, both process and power operators enjoy total plant visualization. Operators now have full insight into the effects that power automation systems have on the process control areas and vice versa. The result is increased availability and faster trouble-shooting.

Increasingly, modern plants are moving to centralized control rooms where process operators, power engineers, and maintenance personnel work together more closely. A common, plant-wide system for process automation and electrical control system tasks helps to further promote collaboration and a consistent operating philosophy across functions. This reduces risk, increases uptime and optimizes overall decision-making.

With one integrated system, all personnel access process and power data through a common interface tailored to that individual's particular role. The process operator's screens default to the flows, temperatures and pressures required to control and interact with the process. The power engineer's displays feature key parameters of the power distribution system. Meanwhile, maintenance professionals see prioritized lists



of work orders for both process and electrical equipment, such as medium- and low-voltage motors, that need their most urgent attention. Underneath the hood, however, each system user has full access to all the same process and electrical data and pertinent alerts, including synchronized lists of alarms and events.

Reduced investment costs

ABB Ability™ System 800xA offers the most cost-effective way of integrating electrical systems:

Reduced system footprint through one common system for both DCS and electrical control. This reduces the initial investment cost in around 30% as well as system maintenance costs. Extensive wiring is replaced with Ethernet protocols (e.g. IEC 61850), which results in cost-effective installation and flexibility in terms of system extension.

One common system reduces overall maintenance costs such as training and spare parts, and enables predictive maintenance strategies.

Automation and power solutions from ABB

ABB's solution includes DCS, substation automation, process electrification integration and

services. As the market leader in DCS, ABB's System 800xA is a competitive and complete DCS system intended for all types of industrial automation. ABB is also the market leader in products for substation and distribution automation. The ABB Relion protection and control IEDs are designed for native IEC 61850 functionality. ABB leads the market in the process electrification area with intelligent LV switchgears, motor controllers and drives.

A wide range of project management and product services for installation, maintenance and operations are also available from ABB across the globe.

Finally, ABB has the unique capability of being both the main electrical contractor (MEC) and main automation contractor (MAC). As the MEC/MAC, ABB has better control over the system design, which streamlines project management by minimizing time-consuming coordination among multiple suppliers. This results in lower project risks and fewer schedule overruns, as well as reduced risk for system integration.

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