



Solutions for steam and combined cycle power plants



Single source provider with worldwide presence

ABB – a life cycle partner

We support our customers through all stages of a plant's life cycle, from project development through operations to life extension. Our advanced life cycle services help to generate extra value from installed assets by maximizing availability and performance. ABB is the ideal partner for utilities, general contractors, plant suppliers, and process equipment suppliers.

High efficiency, low emissions

The huge demand for new power plant capacities can only be met by high efficiency coal, oil and gas fired power plants. New technologies have been developed increasing the efficiencies of steam power plants to more than 44% with the long-term target of crossing the 50% limit in converting fuel into electricity. Efficient advanced control of the plant must be adopted to meet these targets. Modern fossil power plants meet emission rules by applying optimized combustion technologies and employing sophisticated flue gas cleaning lines. In this respect the instrumentation, automation and electrical systems also play an important role in meeting the targets required by authorities for emissions.

Your needs – our response: ABB as single source provider with worldwide presence

We are creating an environment of optimized and efficient operations by combining innovative products, sector-specific solutions and the latest technology with the industry's most experienced engineering experts. We offer the leading portfolio of solutions and services for the power generation industry. Our global footprint comprises of sales offices, service centers and manufacturing facilities in more than 100 countries, providing our customers' power plants with world-class electrical and automation systems.

Advantages of ABB's turn key solutions

Modern power plants rely on sophisticated instrumentation, control and electrical systems, all working in harmony. Dedicated scientists and innovative engineers ensure that power systems operate flawlessly, delivering reliable power. Experts not only contribute their specialized knowledge in the field of instrumentation, control and electrical engineering, but also draw on their extensive knowledge of power plant processes. Plant automation systems combine innovative and broad functionality with proven operational reliability.

The advantages of ABB full scope solutions are:

- easy cooperation
- cost effectiveness
- short delivery time
- high quality
- one partner throughout the plant lifecycle
- longstanding experience, many references

Our ability to execute complex projects has been proven in more than 270 combined cycle power plant and 750 steam power plant installations world-wide.



Integration of instrumentation, control and electrical systems

Electrical Balance of Plant

ABB has the engineering expertise, experience and state-of-the-art technology to deliver „turnkey“ system integration of electrical Balance of Plant (eBoP) applications. We offer complete engineering, procurement, installation, commissioning and testing as well as ensure the quality of the eBoP integration with the complete plant automation system of your power facility. Direct control over all engineering and project management functions enables us to build and maintain reliable power system installations safely and efficiently, offering cost effective solutions.

Grid connections

ABB provides the complete portfolio to connect a power plant to the grid. This includes the bus ducts to connect the generator, the generator circuit breaker, the power transformer and the complete high voltage substation including all protection and control facilities.

Electrical plant auxiliaries

ABB provides medium and low voltage systems consisting of transformers, switchgear, frequency converters and motors. For reliable back-up power ABB can integrate diesel engines and uninterruptible power supply systems (UPS) that include rectifier/battery charger, batteries, inverters, DC switchgear and distribution.

Electrical generator auxiliaries

ABB can provide generator auxiliary systems: excitation systems, generator and unit protection, synchronization, measuring and metering and static starter systems. As part of our excitation systems, we provide microprocessor based voltage regulators for synchronous machines with rotating exciters and static excitation systems for high performance control of synchronous machines.

For gas turbines our static starter system softly accelerates the generator up the ignition speed of the gas turbine. The system allows the same static frequency converter (SFC) to be used for purging and slow turning during cool down of gas turbines.

Variable speed drives

Variable speed drives increase plant availability and flexibility through improved process control. They are being considered more and more often as an alternative to fixed speed motors or controls by throttling valve or liquid coupling in feed water pumps, cooling water pumps, fire fighting pumps and fuel gas booster compressors.

Miscellaneous equipment

ABB delivers additional solutions:

- grounding and lightning protection
- lighting and power sockets
- telephone and communication systems
- security and alarm systems
- clock systems, fire detection, CCTV

Plant automation systems

ABB delivers all the systems required to successfully automate a power plant: from the plant floor to the enterprise level, from system design to operation. Our automation platform, instrumentation, valves and drives are designed for the most stringent requirements of power plant automation and are customized for steam and gas turbine power plants.

ABB's control systems combine innovation and broad functionality with established operational reliability. Development of our power plant control systems is ongoing, with the aim of further improving cost-effectiveness, functionality and quality. The advantages of these control solutions are:

- future-oriented platform for process and electrical systems
- easy-to-use and consistent user interface
- fast analysis of disturbances
- simple plant and enterprise-wide access to information
- high engineering efficiency and quality
- low operating and maintenance costs
- simple system architecture
- state-of-the-art technology including field buses and easy integration methods of existing systems.

Years of experience in the field help ABB engineers design control systems that cover all the plant requirements. One important feature of the plant automation system is total integration of all the main functional areas of the plant into one common system. The system incorporates a uniform operator interface throughout the plant. All data acquisition functions form an integral part of the system, including built-in sequence of events and extensive system diagnostics.

The automation for gas and steam turbine plants can be implemented in one common platform with the following benefits:

- common look and feel in operations
- seamless integration in hardware and software
- common engineering and diagnostic tools
- reduced spare parts requirement
- simplified maintenance and training

Integration of process and substation automation into one system

The requirement of higher operating efficiency in power generation nowadays is more and more in the spotlight. Traditional control systems are confined to the vertical integration of process control. It is quite common to use separate SCADA systems for electrical systems. However, there exists an overlap between these domains: major loads though belonging to the process are operated by medium voltage switch gear. Until now the necessary interconnection required the installation of costly and inflexible marshalling racks. Integrated operation and diagnostics was difficult to implement.

ABB's state-of-the-art control systems connect these two worlds in one system by integration of substation automation. They provide suitable workplaces for the electrical part of the plant and therefore make specialized human-machine interfaces for electrical systems in power plants dispensable. The use of the open standard IEC 61850 provides freedom of choice in equipment and full access to all substation data. The very fact that only one system is needed adds up to a more simple system architecture and hence reduced costs for purchase and maintenance.



Turbine and boiler control

Gas turbine control

ABB can supply turbine control and monitoring solutions for a full range of gas turbines, including heavy-duty machinery. Our turbine control solutions comprise the turbine governor, sequence control, drive control and turbine protection.

Operation of the gas turbine can be fully automated; the various systems of the plant are automatically controlled in a sequential manner. Minimal operator intervention is required to start a complete CCGT unit. The protection can be built as a fault-tolerant 2oo3 system and can include a SIL 3 certified over-speed protection system.

To enable customers to determine the actual state of the machine, a supervision system monitoring turbine speed, vibrations, temperatures and stresses generated can be installed.

Steam turbine control

Over the last 40 years, ABB has proven its expertise in automation projects with most turbine OEMs. These solutions cover control, protection and turbine supervisory equipment. ABB's turbine control solutions are tightly integrated into the plant automation system, ensuring advantageously seamless integration of operation, engineering and diagnostic functions. The steam turbine protection system can be built as a fault-tolerant 2oo3 system and can include a SIL 3 certified over-speed protection system. ABB can supply turbine-specific electro-hydraulic and hydraulic products and solutions as well as design expertise and consulting for steam turbines. Our solutions incorporate universal products, and can be integrated into nearly any type of mechanical system used today.



Hydraulic solutions

ABB can supply turbine-specific electro-hydraulic and hydraulic products and solutions as well as design expertise and consulting for gas and steam turbines. Our solutions incorporate universal products and can be integrated into nearly any type of mechanical system used today. A safety hydraulic controlled 2oo3 trip bloc meets the requirements of SIL 3 according to EN 61508.

Boiler protection / burner management systems

Meeting the highest possible standard of safety and reliability are among the most important requirements in power plant operation.

Boiler protection and burner management systems are dedicated to ensuring boiler furnace safety and fuel shutdown. For the past 80 years, ABB has worked with customers and industry standards organizations to improve boiler safety, particularly during the most hazardous operating phases of start-up and low-load operation.

ABB strictly complies with the mayor industry standards, such as:

- US National Fire Protection Association (NFPA)
- German TRD/DIN
- IEC 61508 safety levels SIL1-3

As well as those of other governing agencies, including:

- Factory Mutual (FM)
- Industrial Risk Insurers,
- Underwriters Laboratories (UL) and
- relevant governmental authorities.

The use of advanced boiler automation systems and the need to comply with the modern safety standards often means that state-of-the-art flame scanners and detectors must be used. For this purpose ABB has developed specific products that meet all modern day industry standards.

Engineering and optimization

Integration engineering

Instrumentation, control and electrical projects for power plants are characterized by engineering processes that concern many technical disciplines such as field instrumentation, cabling, control engineering and electrical components. The parties involved, e.g. general contractors, consortium partners and suppliers, though with different functions, are working on the same project at the same time, usually at different distributed locations. The engineering process for such a project can be a major challenge, since distributed and simultaneous procedures need to be accurately coordinated and target oriented. The engineering tools must be suitable for handling a series of complex interfaces for exchanging data and documents, while assuring a steady revision process and a high degree of consistency and completeness of the documentation.

With its Engineering Integration Platform EIP ABB applies a consistent solution for the entire engineering process, ranging from input management for the process data needed for detail engineering, installation and commissioning to the compilation of a consistent plant-specific documentation.

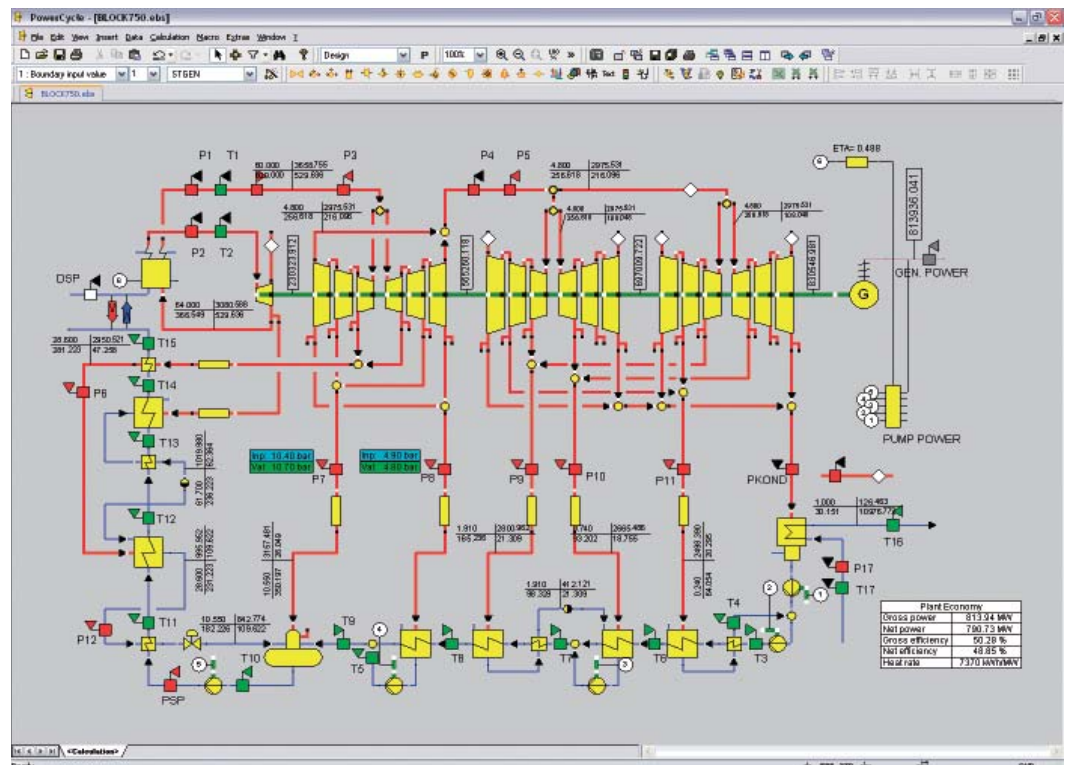
Power plant optimization – OPTIMAX®

Technological advances in the field of control and software engineering have enabled innovative plant optimization solutions. OPTIMAX is a set of decision-support tools that continuously assess conditions in the plant and provides root-cause fault analysis for situations affecting the plant's performance.

In operations, customers use OPTIMAX to monitor and predict plant performance; issue early warnings for equipment diagnosis, sensor validation and preventive maintenance; and improve plant efficiency by reducing fuel consumption and resulting emissions. The advantages for maintenance include reduced downtime and maintenance costs as well as improved data access for daily inspections and outage planning. The huge demand for new power plant capacities can be met by high efficiency coal, oil and gas fired power plants. New technologies have been developed increasing the efficiency of combined cycle power plants toward 60%. Efficient advanced control of the turbine and the plant must be adopted to meet these targets.

Modern combined cycle power plants meet emission rules by applying optimized combustion technologies. In this respect the instrumentation, control and electrical systems also play an important role in meeting the targets required by the emission authorities.

OPTIMAX adjusts the combustion process and reduces emissions by monitoring flame quality, measuring coal flow and carbon-in-ash content; and improves controls with advanced process control solutions. In asset management we can schedule the most economical operation of different generating units, balancing income from sales against emissions and saving customers money in both emissions and life-cycle costs.





Life cycle commitment

We support our customer base through global service contracts assisted by a strong localized service organization. This organization offers advanced and efficient services from a comprehensive and modular portfolio to provide emergency remediation, preventive maintenance and remote diagnostic services. Additionally, we help our customers maintain their financial and intellectual investment in their assets through training programs, consulting services and comprehensive migration strategies for system upgrades and retrofits.

ABB is committed to being the world leader in providing total integrated automation solutions for power generation, allowing our customers to meet the complex automation challenges of today and tomorrow.

Recent references

Nuon Magnum Power Plant, Netherlands

EPC contractor: Mitsubishi Heavy Industries Japan
Completion: 2011

Key figures

- Fully integrated 1300 MW gasification combined-cycle plant
- Switchgear housed in modular pre-fabricated units for easy site installation
- 380-kV GIS substation will be used to connect the plant to the grid

Walsum 10, Duisburg, Germany

Enduser: STEAG
Customer: Hitachi Power Europe (EPC)
Completion: 2009

Key figures

- 750 MW clean coal power plant with high efficiency and low emissions
- Complete electrical system (EBoP)
- Process control system including boiler and turbine control
- process optimization

HuaNeng QinBei Power Plant, Henan Province, P.R.China

Customer: HeNan HuaNeng QinBei
Power Generation
Completion: 2008

Key figures

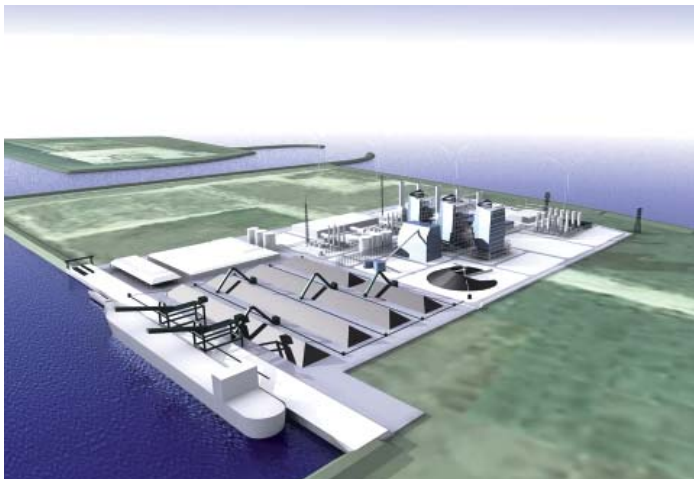
- 4x600MW coal fired supercritical units, clean coal power plant
- Same type of DCS to cover full functions of unit
- Guardant that units would meet all performance criteria

Ras Abu Fontas BII, Qatar

Enduser: Qatar Electricity and Water Company
Customer: GE
Completion: 2007

Key figures

- CCPP with 550 MW electrical power and desalination of 40 million gallons water/day
- Complete design, engineering, installation and commissioning of the electrical systems





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