ABB solutions for fossil power plants
ABB power generation
A reliable partner for comprehensive solutions

Experience of more than 40 years in power plant automation in more than 1200 turbine automation projects guarantees well proven and cost effective solutions

Know how of various turbine types / suppliers assures state of the art technology and high quality

Modular design of ABB-products allows

- Custom tailored technical concepts
- All sizes of applications and uniform solutions for all type of turbines
- Step by step replacement of installed equipment
- Most cost effective solutions for the customers
Facts about ABB in power generation

- Worldwide system business of more than 2,000 MUSD
- Worldwide product business in the same range
- Over 3,500 employees, mainly engineers
- More than 40 local/regional business units/centers worldwide
- Covering whole range of Instrumentation, Controls and Electrical systems for Power Generation („ICE“)
- Working relations with key players in the industry
- Strong local competence
ABB power generation
Control and electrical systems by ABB for

Steam Power Plants

Gasturbines / CCPP

Waste-to-Energy

Co-gen

Nuclear

Hydro Plants

Wind

Solar

Desalination

Diesel Plants
Fossil power plants
Plant life cycle support

Consulting and project development

engineering / design

procurement / production

installation and commissioning

operation / maintenance / service

retrofit / optimization

plant rehabilitation
ABB supplies an unparalleled selection of field equipment for all applications in power plants

1. Stack
2. Fuel system
3. Fuel supply (conveyor or compressor)
4. Boiler outlet
5. Combustion system
6. Scrubbers
7. De-aerator
8. Boiler feedwater
9. Electrical balance of plants
10. Sample station
11. Extraction pump
12. Condensator
13. Turbine and generator
14. Control room
15. Cooling water system
16. Steam line
17. Boiler drum
DCS: Consistent technology

- Operating
- Monitoring
- Optimization
- Trend curves
- Reports

Workplaces

- Fieldbus
- HART

Controller
- Local I/O

Unit
- Turbine
- Boiler protection system
- Auxiliary systems (BoP)

Remote I/O

System server

IEC 61850

Generator/ Unit protection system
- Electrical auxiliary power supply

Intelligent Electronic Devices (IED)

Office workplaces
- Network control centers
- Remote access
- Maintenance management
- SAP system

Enterprise LAN

WLAN

Plant network

Control network

Remote access

Maintenance management

SAP system

Enterprise LAN

WLAN

WLAN

Systems installed by ABB

Third-party systems black boxes
Fossil power plants
Benefits of modern plant control

Fossil power plant targets
- Reduction of operational cost
  - Manpower
  - Waste throughout / ash quality
  - Maintenance cost
- High availability
- Less trips by protection intervention
- No downtime by DCS
- Reduction of initial cost

Control system solutions
- Performance optimization
  - Degree of automation
  - Advanced control solutions
  - Total plant DCS
- Optimized redundancy
  - 2 out of 3 protection
  - Detailed and fast diagnosis
  - Hot replacement
- Scalable system in HW and SW
Fossil power plants
Information management and plant-optimization

Optimization
- Boiler Startup Optimization
- Combustion Optimization
- Process/Operation Optimization
- Unit Commitment

Monitoring
- Loop Performance Monitoring
- Vibration Monitoring
- Emission Monitoring
- Turbine Stress Calculator
- Lifetime Monitoring
- Performance Calculations
- Simulation and Validation

Advanced Control
- Unit Control
- Condensate Throttling
- Live Steam Calculator
- State Space Controller

Information Management
- Information Management System
- Event/Alarm Management
- Electronic Shift Book

Maintenance Management
- Maintenance Management System
- SAP/PM Interface
Fossil power plants
Reports for plant management support

Balance reports
- Typical values for operating tracking, e.g. average / max / min / total of
  - Plant output
  - Electrical meter readings
  - Emissions monitoring, also for authorities
  - Consumables (e.g. NH3 spray water)

Trend reports
- Presentation of process behaviour with free configurable
  - Time intervals
  - Time range

Maintenance reports
- Informs the maintenance staff about:
  - Actual operating hours
  - Actual switching cycles
  - Identification of components to be maintained
Fossil power plants
Services for fossil power plants

- Consulting from Center of Competence
- International / local presence
- Engineering / design
- Studies
- Supply of DCS, eBoP and instrumentation
- Retrofit, upgrade, extension
- Handling of interfaces
- Installation and commissioning
- Project management

Electrical Balance of Plant
Fossil power plants
Optimal and consistent system design

Process knowledge is the prerequisite for optimal and consistent design of controls and electrical systems. (sizing of systems and seamless integration) These systems proof to have a higher availability and a better energy efficiency.

Customer objectives, e.g.
- Availability
- Redundancy
- Performance
- Energy efficiency

P&I-Diagramm

Operating criteria, e.g.
- Operating mode
- Component design
- Sizing and layout HV, MV, LV, transformers
- Duty cycle
- Plant maneuverability
- Load flow, voltage drop

DSC-configuration

Optimized interface management

Single line diagram
Fossil power plants
Excellence in electrical layout design

- Energy Efficiency
- Short-circuit calculation
- Definition of voltage levels
- Load flow and voltage drop calculation
- Voltage and reactive power control
- Cable dimensioning
- Selectivity analysis
- Earthing- and lightning-protection
- Layout design of new electrical systems
- Assessment and conceptual engineering for retrofits
- Cost calculations
- Seamless integration of all systems
Fossil power plants
Control of the burner stoichiometry

Products

PfMaster system (pulverized fuel)
  - Online-values of the coal flow split between distribution and pipes
  - Reduces excess air and NO$_x$

Components
  - Sensor: tailor made pipe section with sensor electronics
  - Signal-processing computer

Low maintenance
  - Visual inspection during outage
  - No on-site calibration

Modular scaleable system
  ⇨ Increase boiler efficiency
  ⇨ Reduce ammonia consumption
  ⇨ 1 to 2 year ROI

Solutions
Fossil power plants
Flame detection and analysis

ABB offers a wide product selection for any fuel and firing type

To primary components

- Flame scanner
  - Identifies potential dangerous “flame out” conditions
  - Converts light energy from burner flames to electrical signals
- Flame analysis unit
  - Takes electrical signals and determines if the flame is proven
  - Remotely mounted

For each application the appropriate flame detection!
Fossil power plants
Emission monitoring systems

- Pre-engineered with compact / modular design
- Powerful NDIR and FTIR analyzer technology
- Remote communication
- Implementation of international emission monitoring guidelines (EPA, BlmSCHV)

Reliable – low maintenance – one system
Boxberg Unit IV, 900 MW, Germany

Customer need
- Greenfield power plant to replace outdated units from former GDR times
- High degree of automation for reduced operational cost

ABB’s response
- Process control system including boiler protection
- Information management
- OPTIMAX® applications

Customer benefits
- Single source for DCS and eBoP with short delivery time and optimized interfaces
- Leading automation and optimization technology for
  - Load flexibility
  - Frequency control and grid stability
  - Emission control
Torrevaldaliga Clean Coal Power Plant, Italy

Customer need

- Conversion of the heavy fuel power plant to “clean coal” technology
- Increase Torrevaldaliga’s net efficiency from 39% to 45%
- Reduce emissions substantially: SO2/NOx/Dust from 400/200/50 to 100/100/15 (mg/Nm3)
- Partial re-use of existing electrical equipment

ABB’s response

- ABB’s state-of-the-art power plant automation system supplies Enel with the technically superior solutions
- ABB’s proven ability to develop and manage large, complex projects
- MV and LV switchgear and SCADA, electrical protection system

Customer benefits

- Coordination of the different Enel’s suppliers during the engineering phase to obtain an homogeneous Distributed Control System fulfilling Enel’s requirements and standards
- Integrated Factory Acceptance Test
- Erection and commissioning of the system
Tutuka, 3.600 MW, South Africa

**Customer need**
- Modernization of 6 x 609 MW coal fired power plant with higher efficiency and lower emissions
- Redesign for turbine control and protection

**ABB’s response**
- Complete DCS and instrumentation
- Boiler protection, turbine hydraulics and control
- Model-based MODAN unit control system

**Customer benefits**
- Common, integrated control system for low life cycle costs, covering DCS, boiler protection and turbine control
- Leading automation and optimization technology for
  - Improving the power plant efficiency and start-up processes
  - Increased frequency accuracy and grid stability
- Replacement of maintenance-intensive mechanical-hydraulic turbine control by electro-hydraulic system with higher accuracy and low maintenance cost
Customer need
- 4x600MW coal fired supercritical units, clean coal power plant with high efficiency and low emissions
- Full control functions cover 4 units and common auxiliary system
- The project demanded a high level of product quality and technical
- The first Chinese home made supercritical unit project

ABB’s response
- Full function of unit control, and common electronic system control. Cover boiler, turbine, BoP and electric common system controls
- Functions include: SCS, MCS, DEH, MEH, DAS, FSSS, ECS
- Include large screen system and CCR

Customer benefits
- Same type of DCS to cover full functions of unit
- Short delivery time and commissioning time
- Guardant that units would meet all performance criteria
- Improving efficiency and reducing emission