

# 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



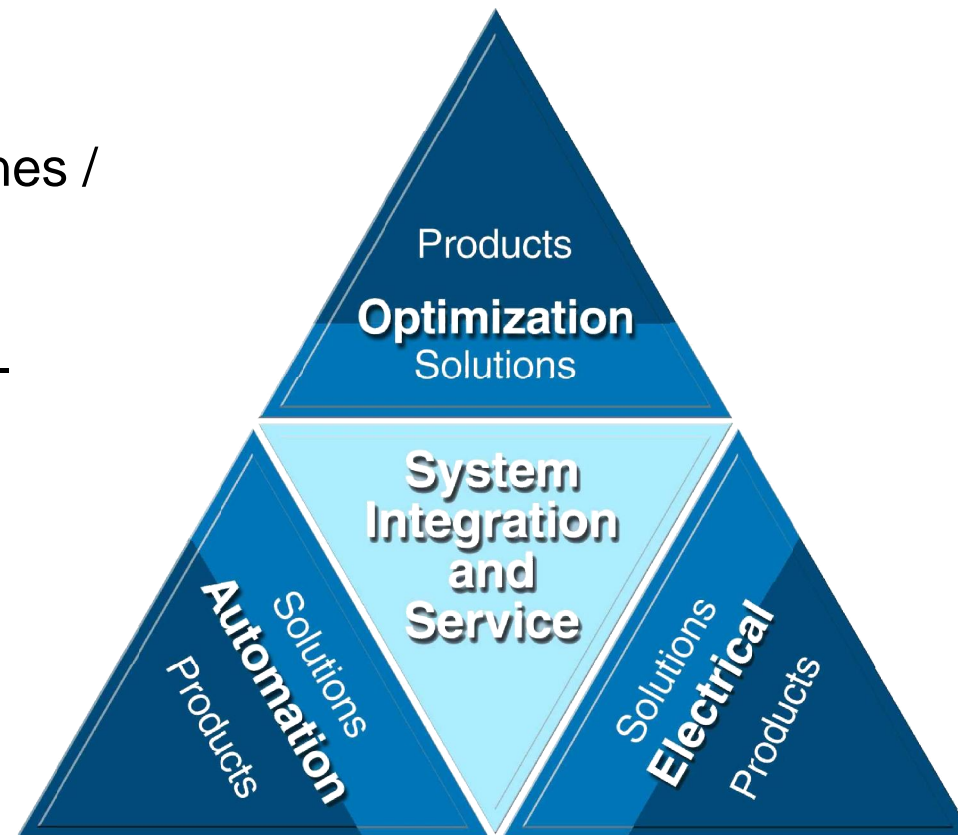
Waste-to-  
Energy



Co-gen



Nuclear



Hydro Plants



Wind



Solar



Desali-  
nation

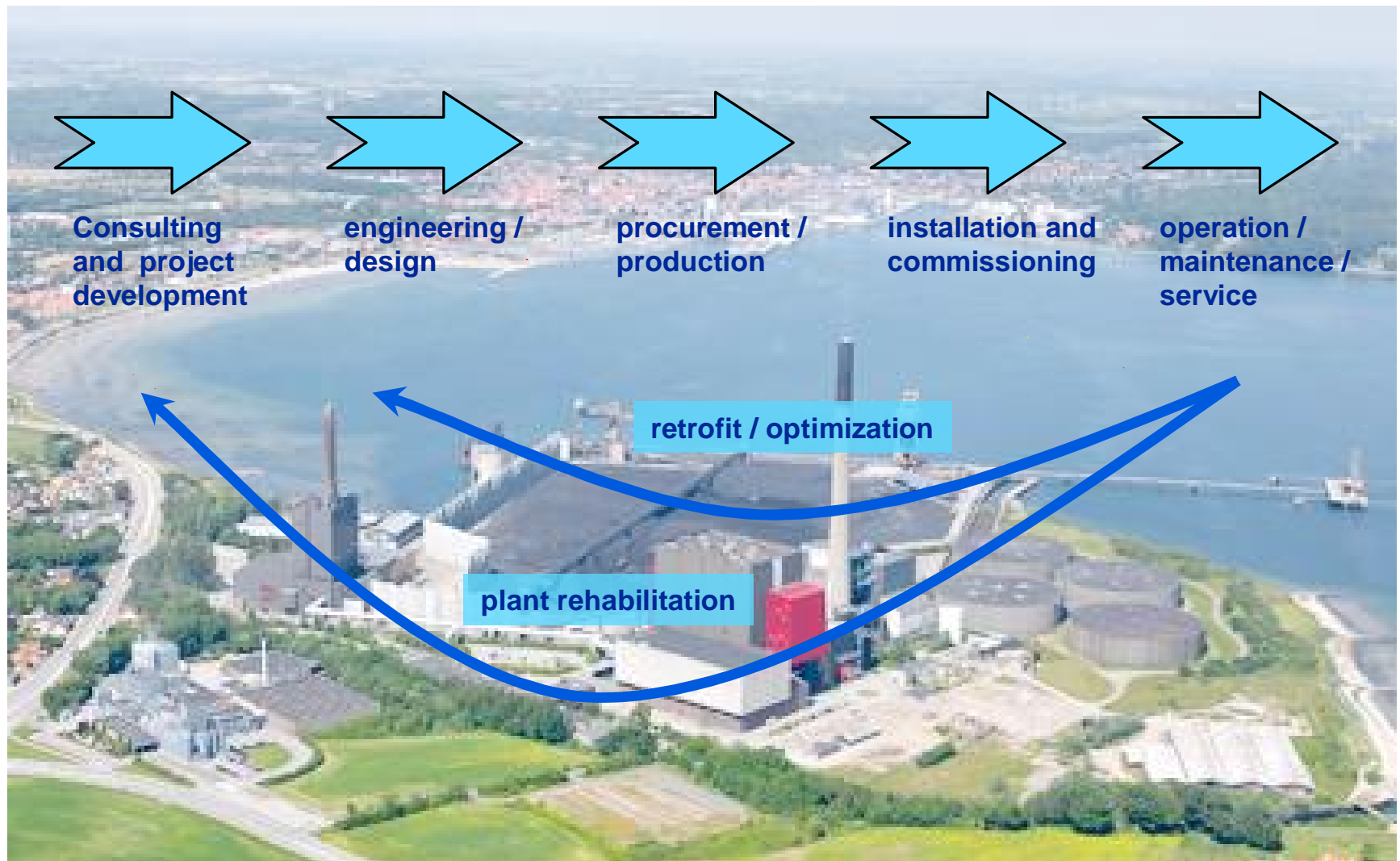


Diesel  
Plants



# Fossil power plants

## Plant life cycle support

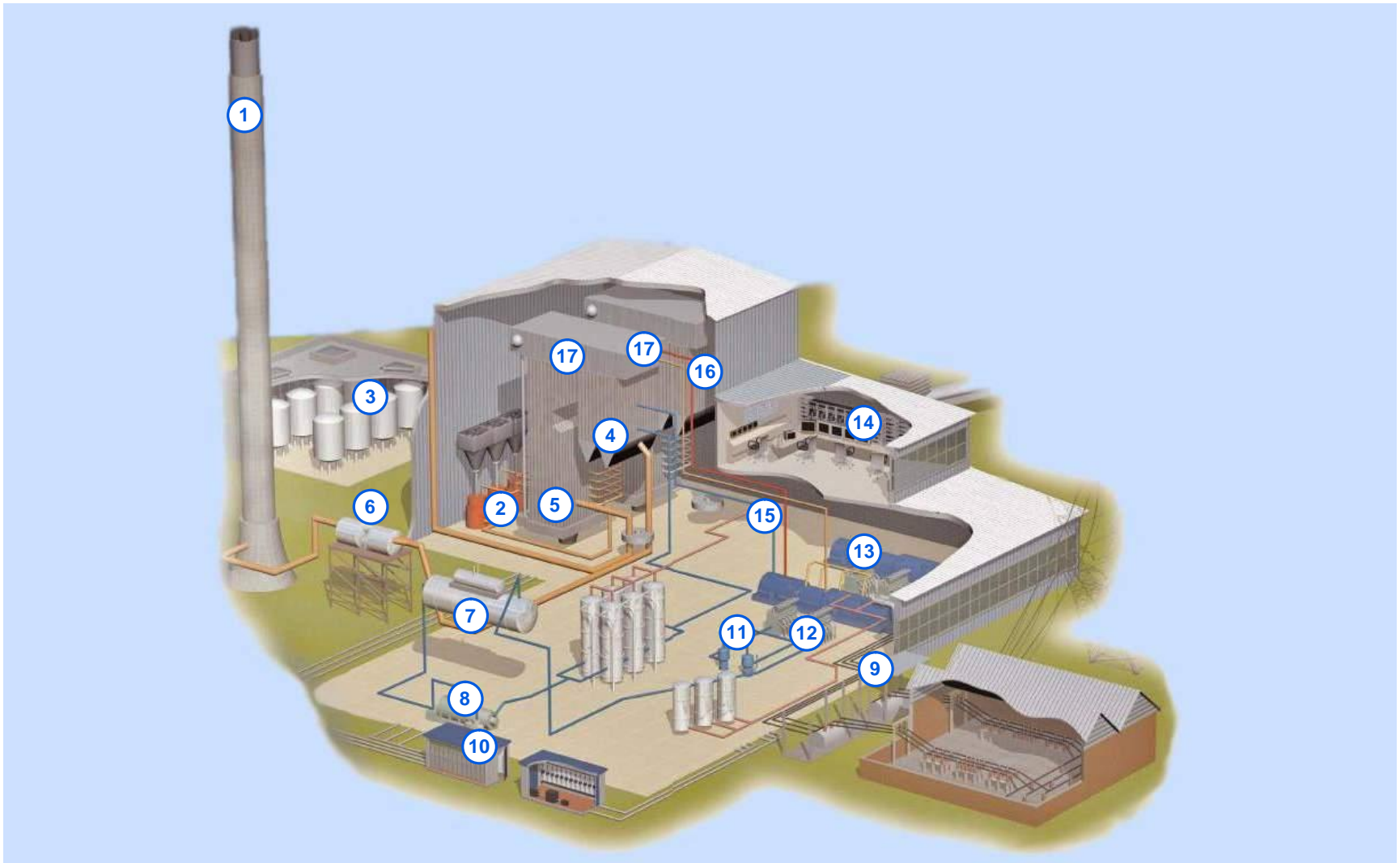


# Fossil power plants

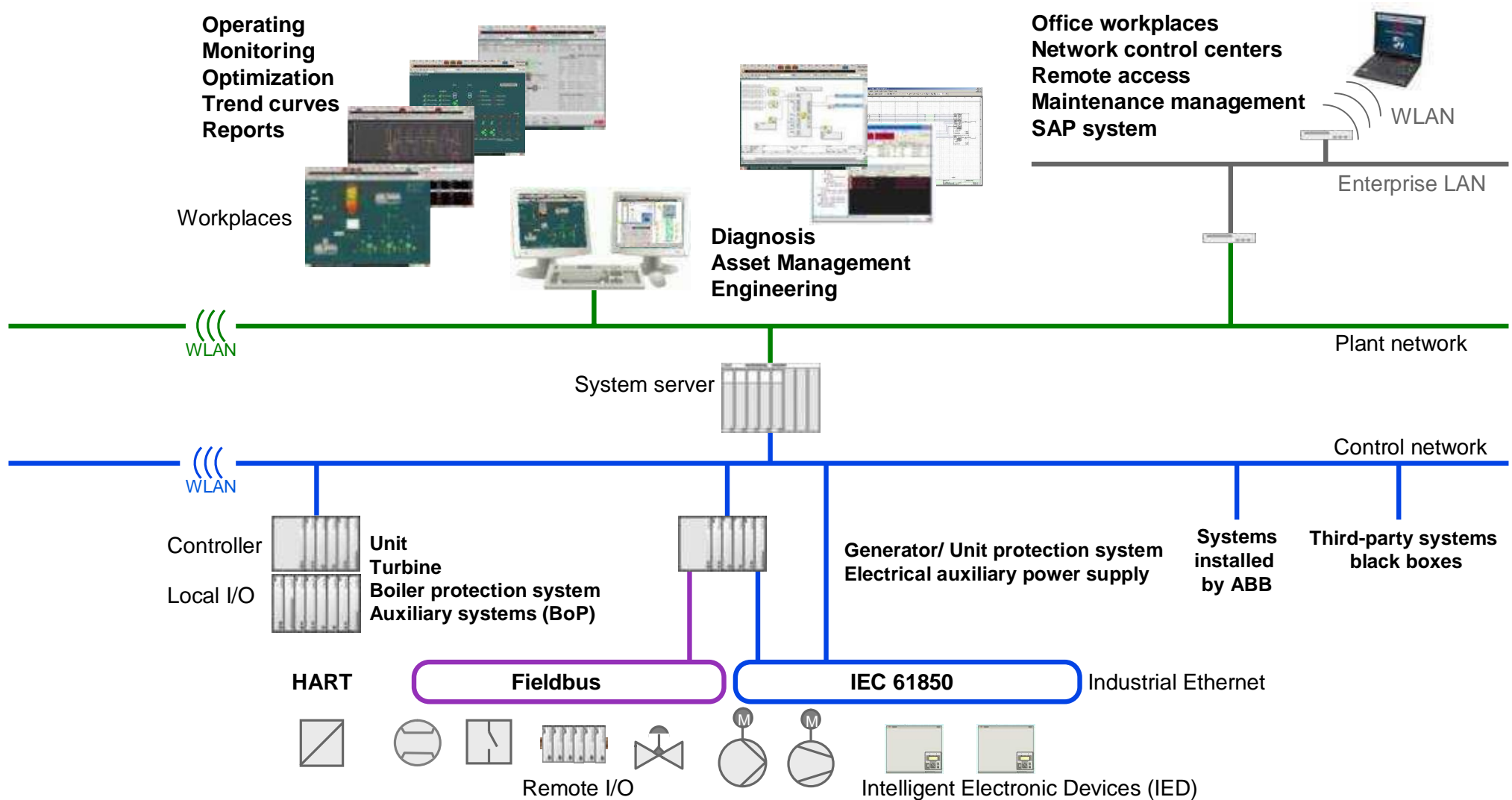
## Field equipment from ABB

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



# 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

### Maintenance Management

- Maintenance Management System
- SAP/PM Interface

### Information Management

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

### Advanced Control

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

### Monitoring

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

# Fossil power plants

## Reports for plant management support

The image displays three screenshots of a software interface for fossil power plant management. Each screenshot shows a data table with multiple columns and rows, representing different types of reports. The top screenshot shows a 'Balance report' with columns for various parameters and their values. The middle screenshot shows a 'Trend report' with columns for time intervals and ranges. The bottom screenshot shows a 'Maintenance report' with columns for component groups and their operating hours, switching cycles, and identification numbers.

### 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

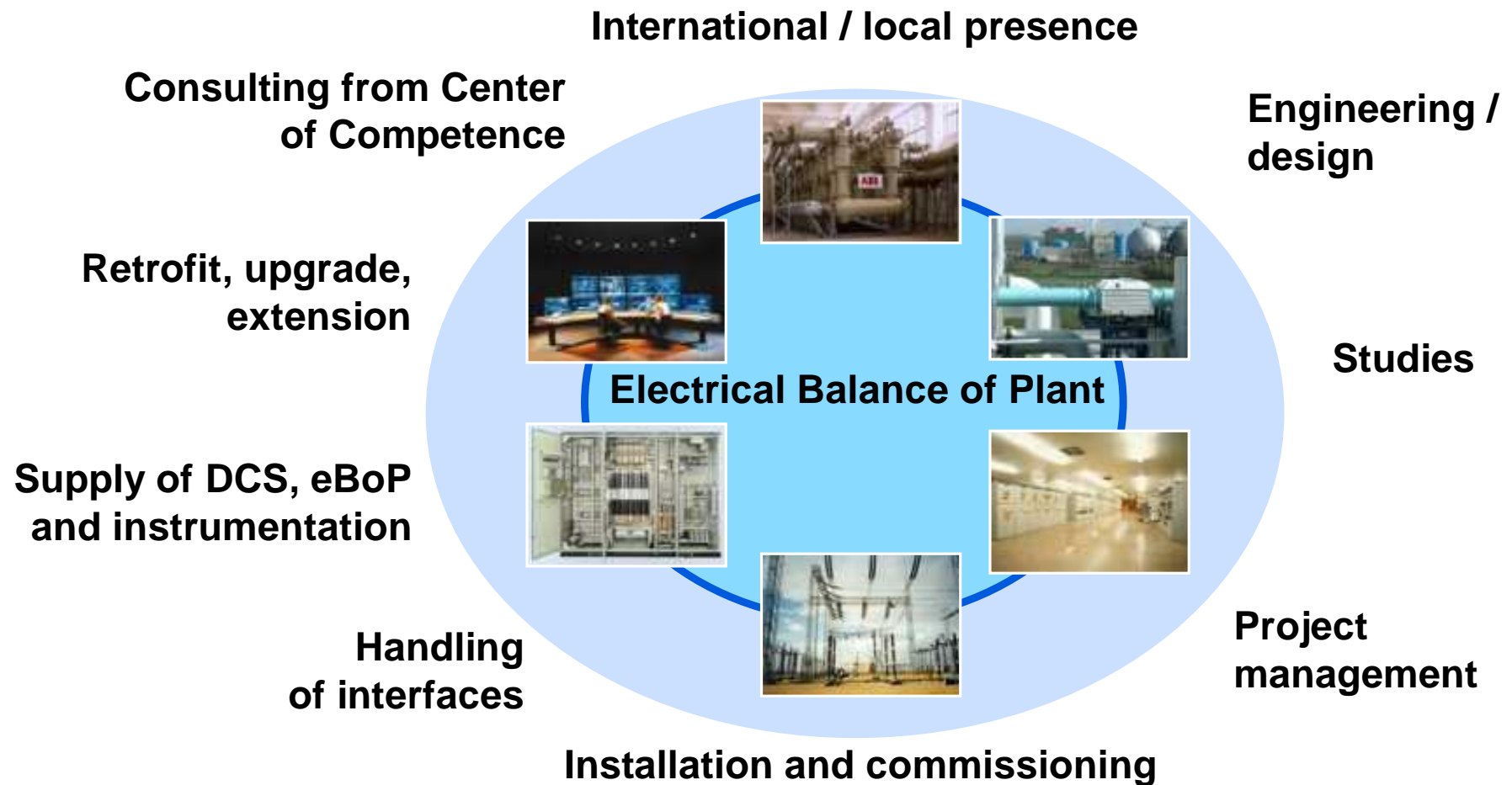
- Presentation of process behaviour with free configurable
  - Time intervals
  - Time range

### 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



# Fossil power plants

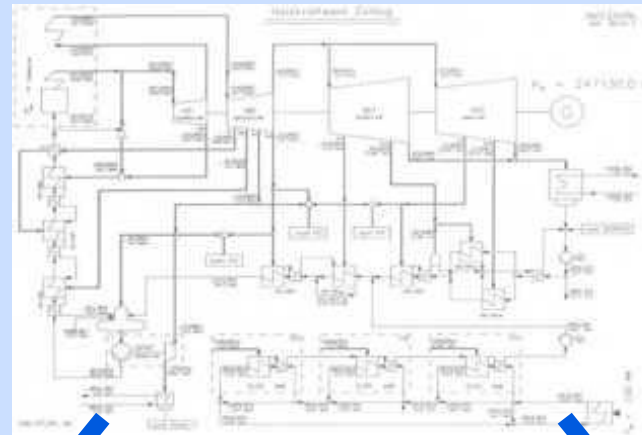
## Optimal and consistent system design

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

### Customer objectives, e.g.

- Availability
- Redundancy
- Performance
- Energy efficiency

### P&I-Diagramm



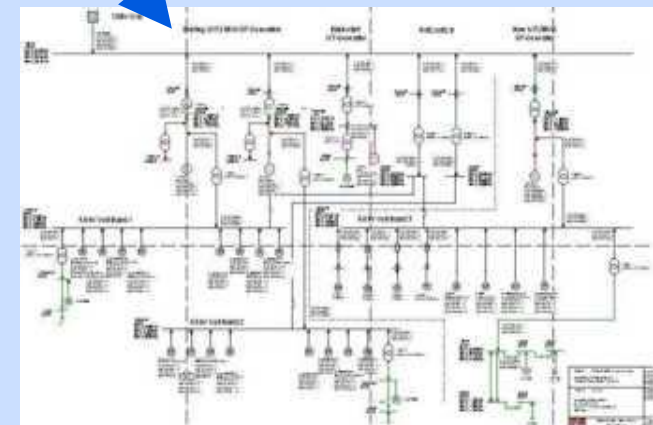
### Operating criteria, e.g.

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

### DSC-configuration



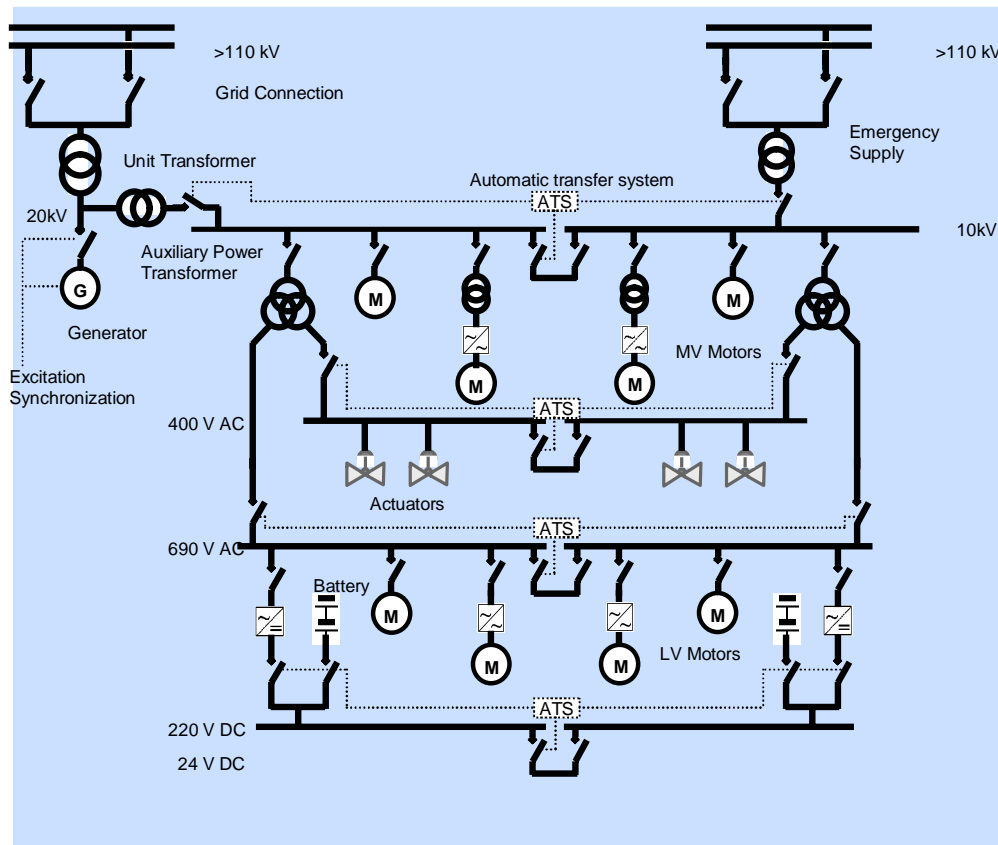
### Single line diagram



Optimized interface management

# 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



### PfMaster system (pulverized fuel)

- Online-values of the coal flow split between distribution and pipes
- Reduces excess air and  $\text{NO}_x$

### Components

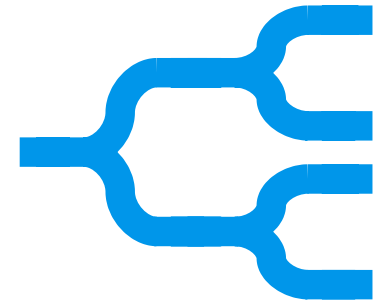
- Sensor: tailor made pipe section with sensor electronics
- Signal-processing computer

### Low maintenance

- Visual inspection during outage
- No on-site calibration

### Modular scaleable system

- ⇒ Increase boiler efficiency
- ⇒ Reduce ammonia consumption
- ⇒ 1 to 2 year ROI



# 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!**

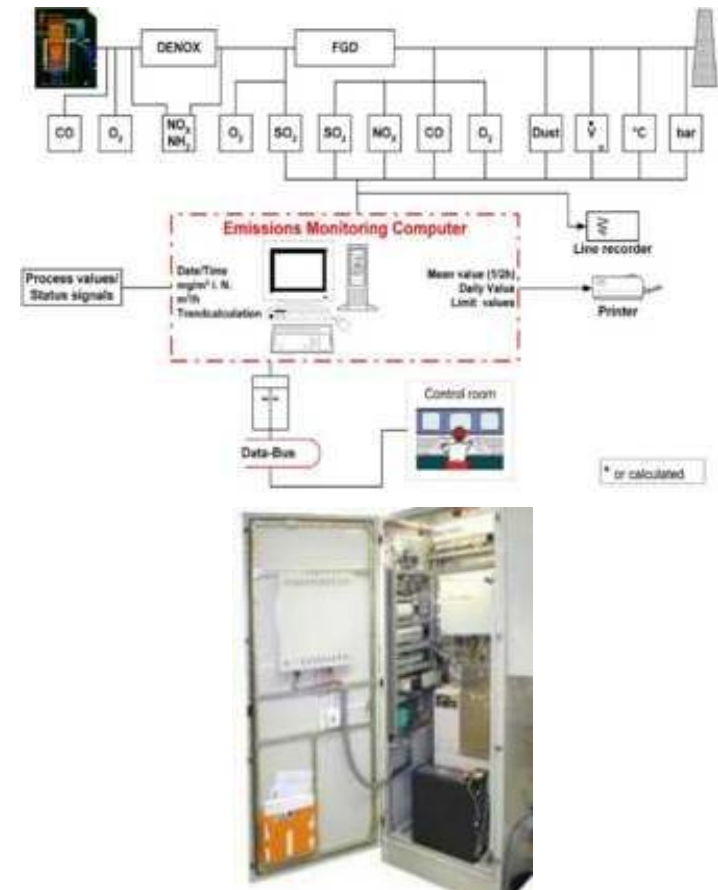
# Fossil power plants

## Emission monitoring systems

### Products

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

### Solutions



Reliable – low maintenance – one system

# Boxberg Unit IV, 900 MW, Germany



Boxberg Unit IV,  
Boxberg, Germany  
Customer: Vattenfall  
Europe Generation  
Year of  
commissioning: 2000

## 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



Torrevaldaliga Nord, 3  
x 660 MW supercritical  
coal fired units,  
Civitavecchia, Rome,  
Italy  
Final Customer: Enel  
Produzione  
Full commercial  
operation end 2008

## 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: SO<sub>2</sub>/NO<sub>x</sub>/Dust from 400/200/50 to 100/100/15 (mg/Nm<sup>3</sup>)
- 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



Tutuka, 6 Units, 3.600  
MW, South Africa  
Customer: Eskom  
Year of  
commissioning: 2006

## 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

# QinBei Power Plant, 4x600MW, China



HuaNeng QinBei  
Power Plant, Henan  
Province, P.R.China  
Enduser: HPI  
Customer: HeNan  
HuaNeng QinBei  
Power Generation  
Co., Ltd  
Year of Commercial  
operation Phase I  
2x600MW: 2004  
Phase II 2x600MW:  
2008  
Awards: Asian Power  
Project of the Year  
2006

## 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

Power and productivity  
for a better world™

