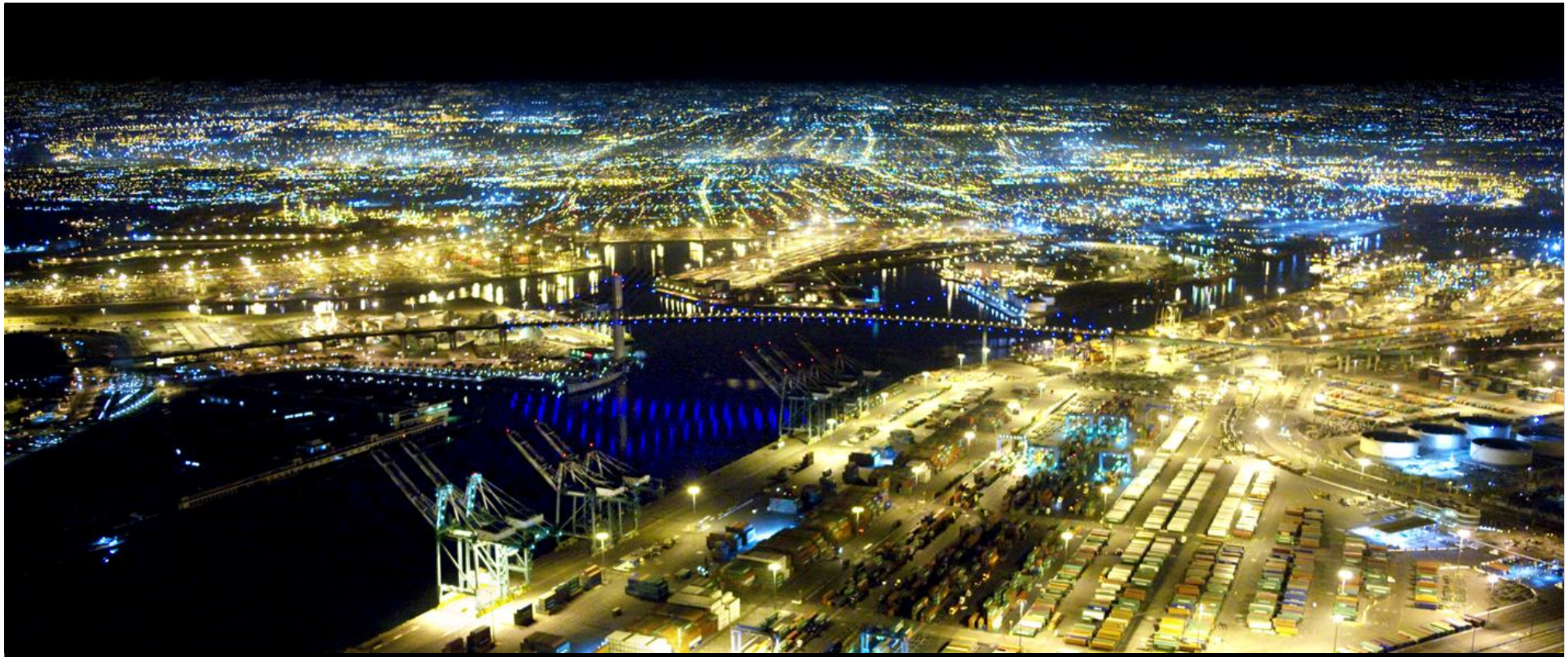


Solutions for Waste-to-Energy-Plants

Power and productivity for a better world™

ABB Power Generation
Controls, instrumentation & electrical systems by ABB

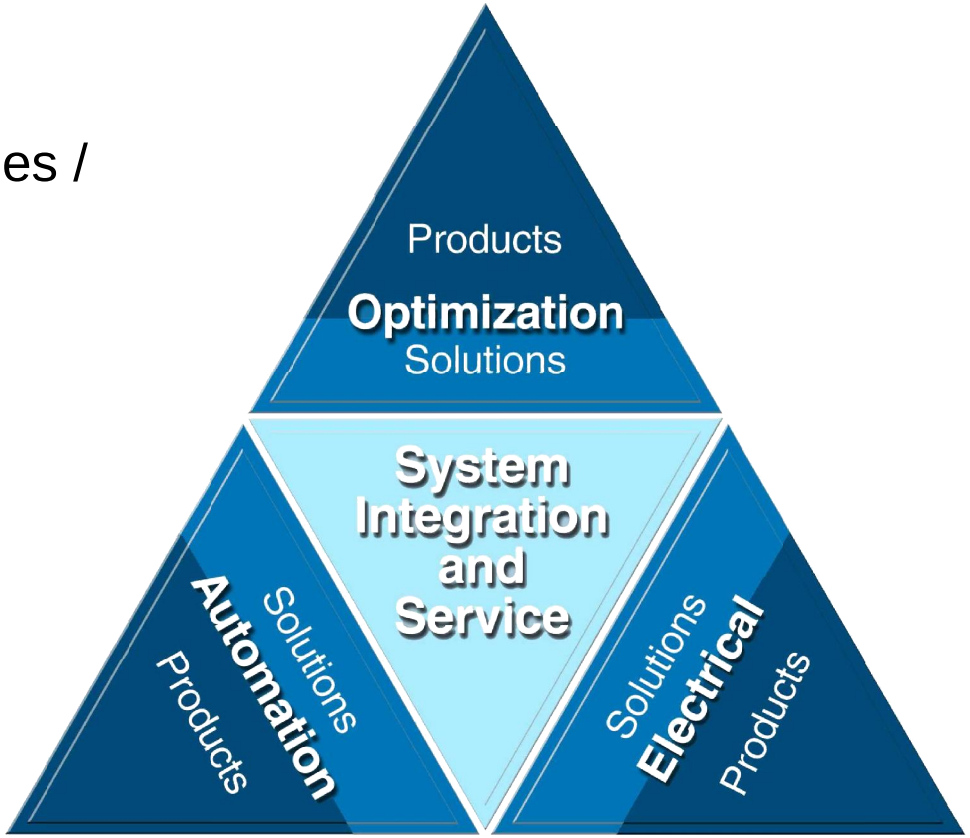
Steam Power Plants

Gasturbines / CCPP

Waste-to-Energy

Co-gen

Nuclear



Hydro Plants

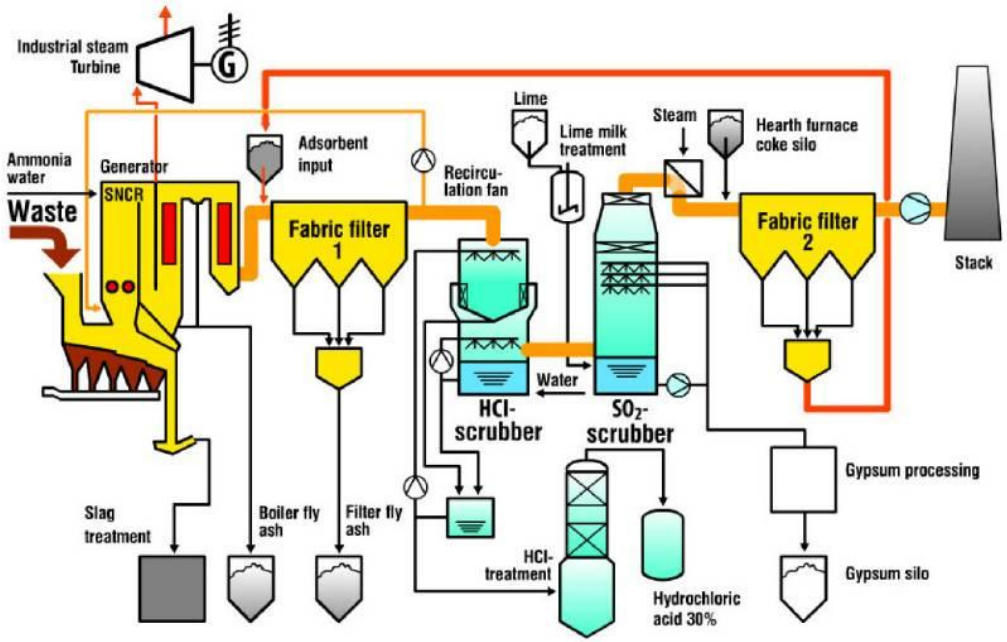
Wind

Solar

Desali-nation

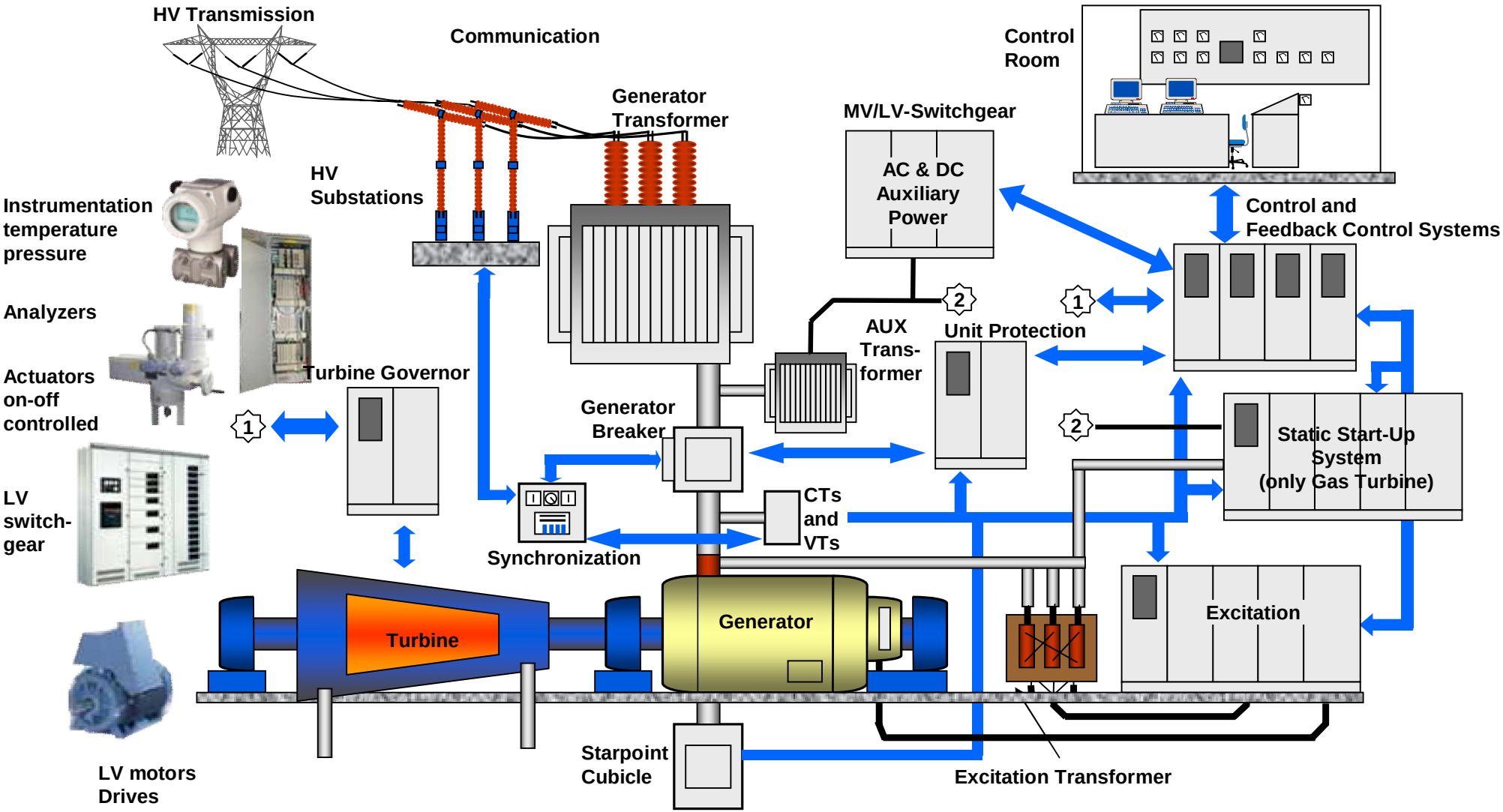
Diesel Plants

Waste-to-Energy
Basic WtE plant layout

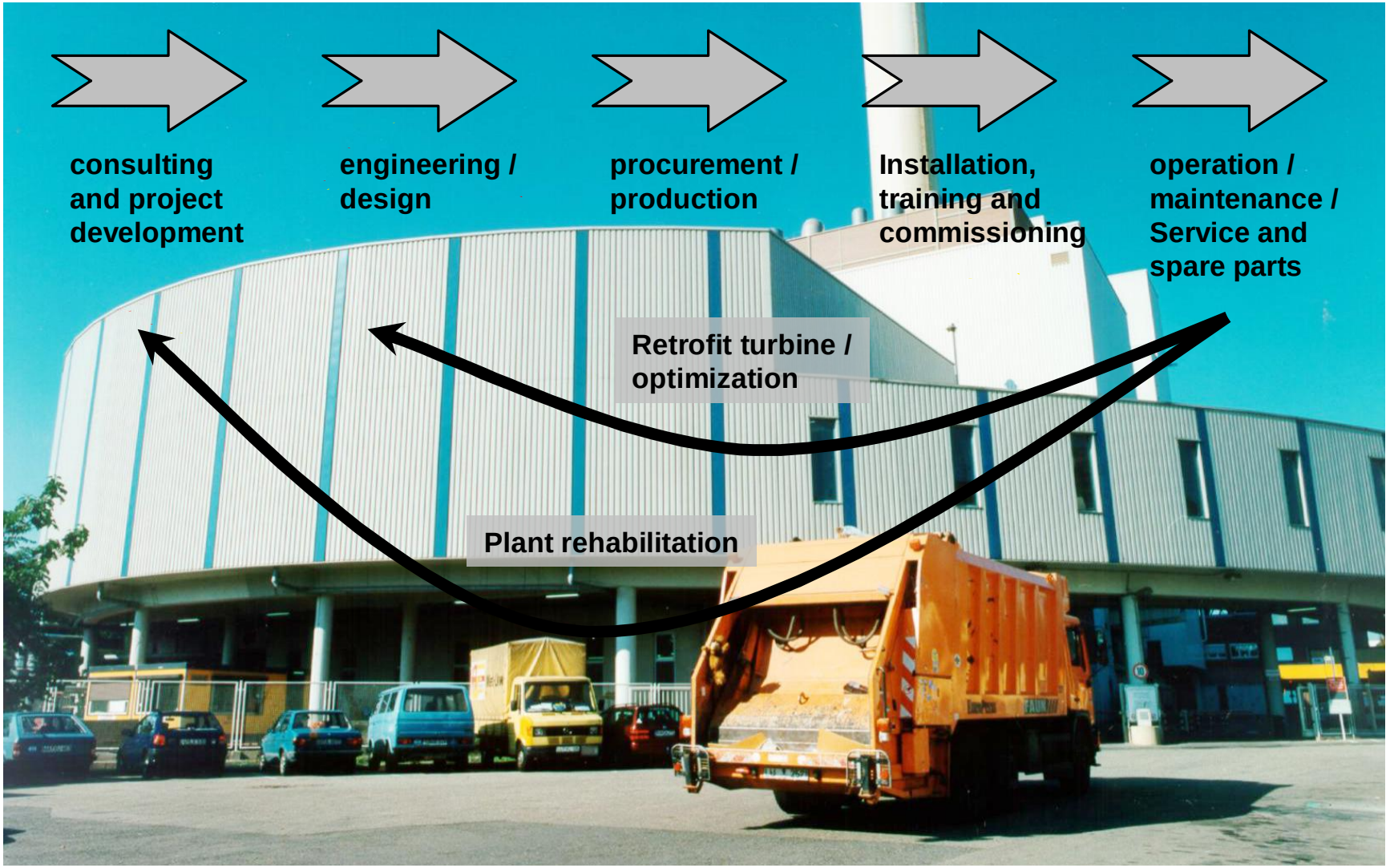


- Typical plant size 160,000 tpa corresponding to 60 MW $_{th}$ resp.14 MW$_{el}$
- Waste volume is reduced by about 80%
- Waste is regarded as a renewable energy source
- Ash quality may be improved by optimized combustion control
- Modern and efficient flue gas treatment systems allow to achieve the mandatory emission limits
- Extraction of District Heat, Cooling or Process Steam allows to achieve the requested efficiency factor of R > 0.65

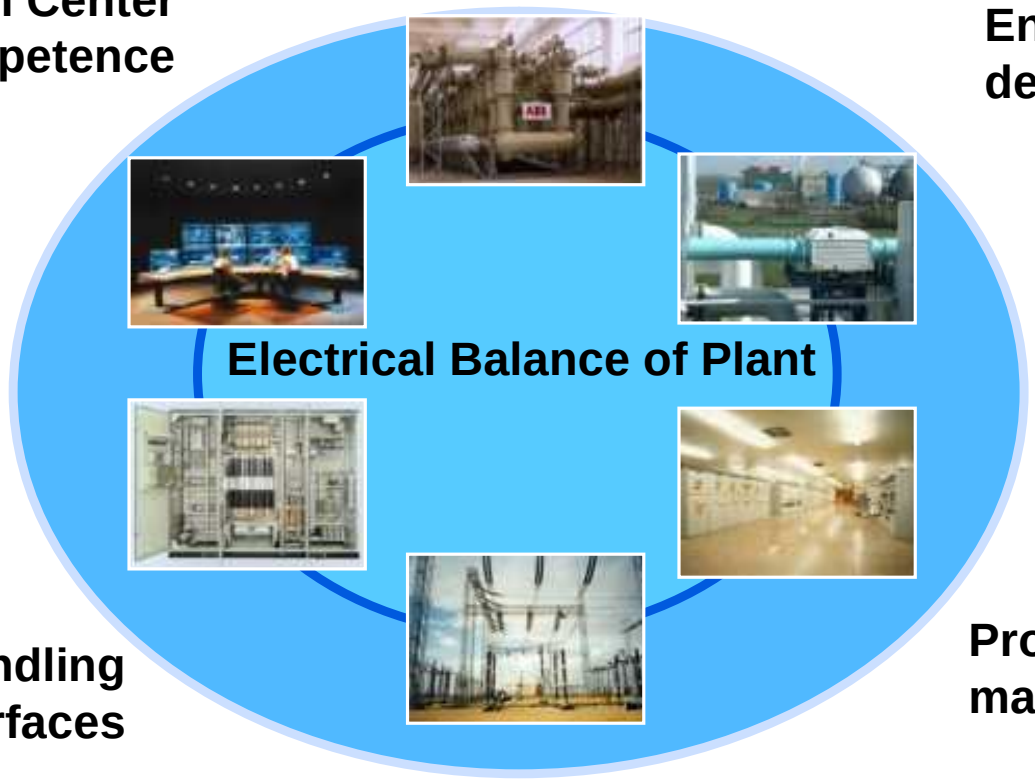
Waste-to-Energy
ABB - from grid connection to instrumentation



Waste-to-Energy
Plant life cycle support for energy efficient WtE plants



Waste-to-Energy
Competent Services for WtE plants



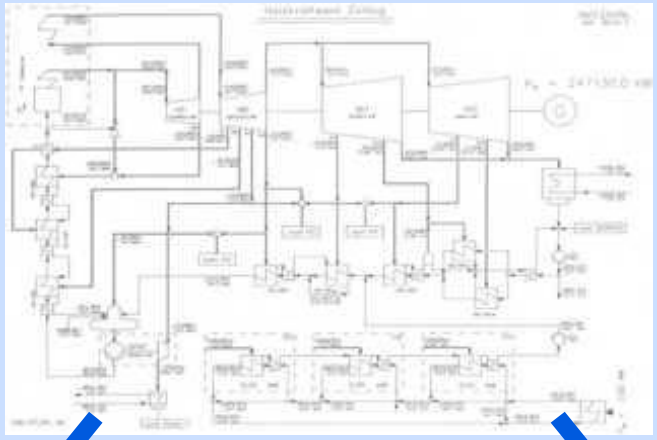
Waste-to-Energy
Optimal and consistent system design

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



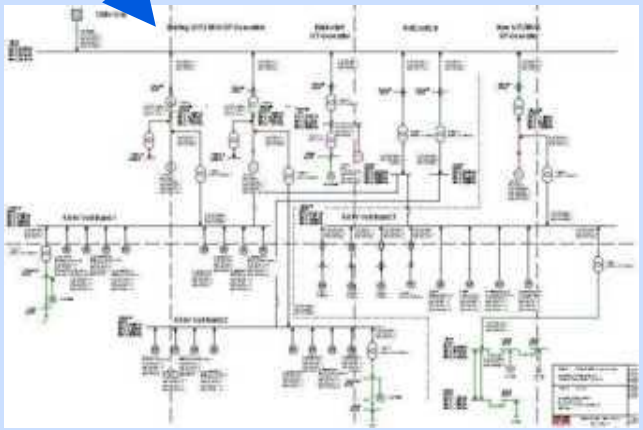
Operating criteria, e.g.

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

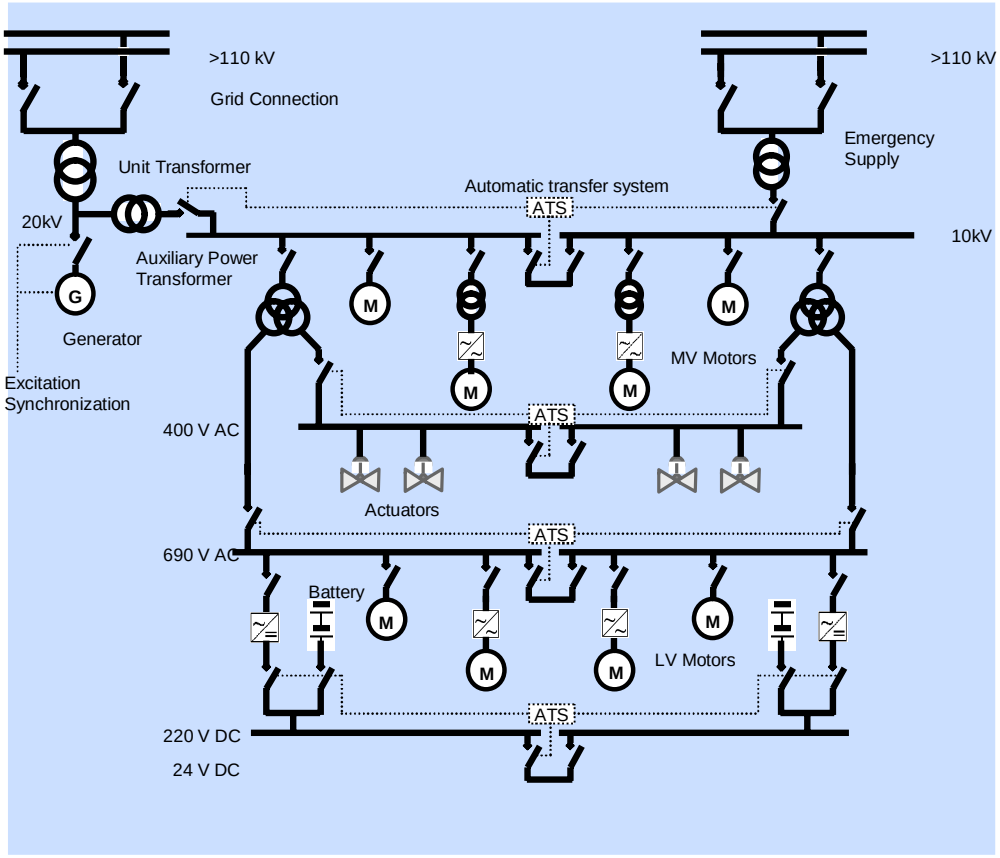
DSC-configuration

Optimized interface management

Single line diagram

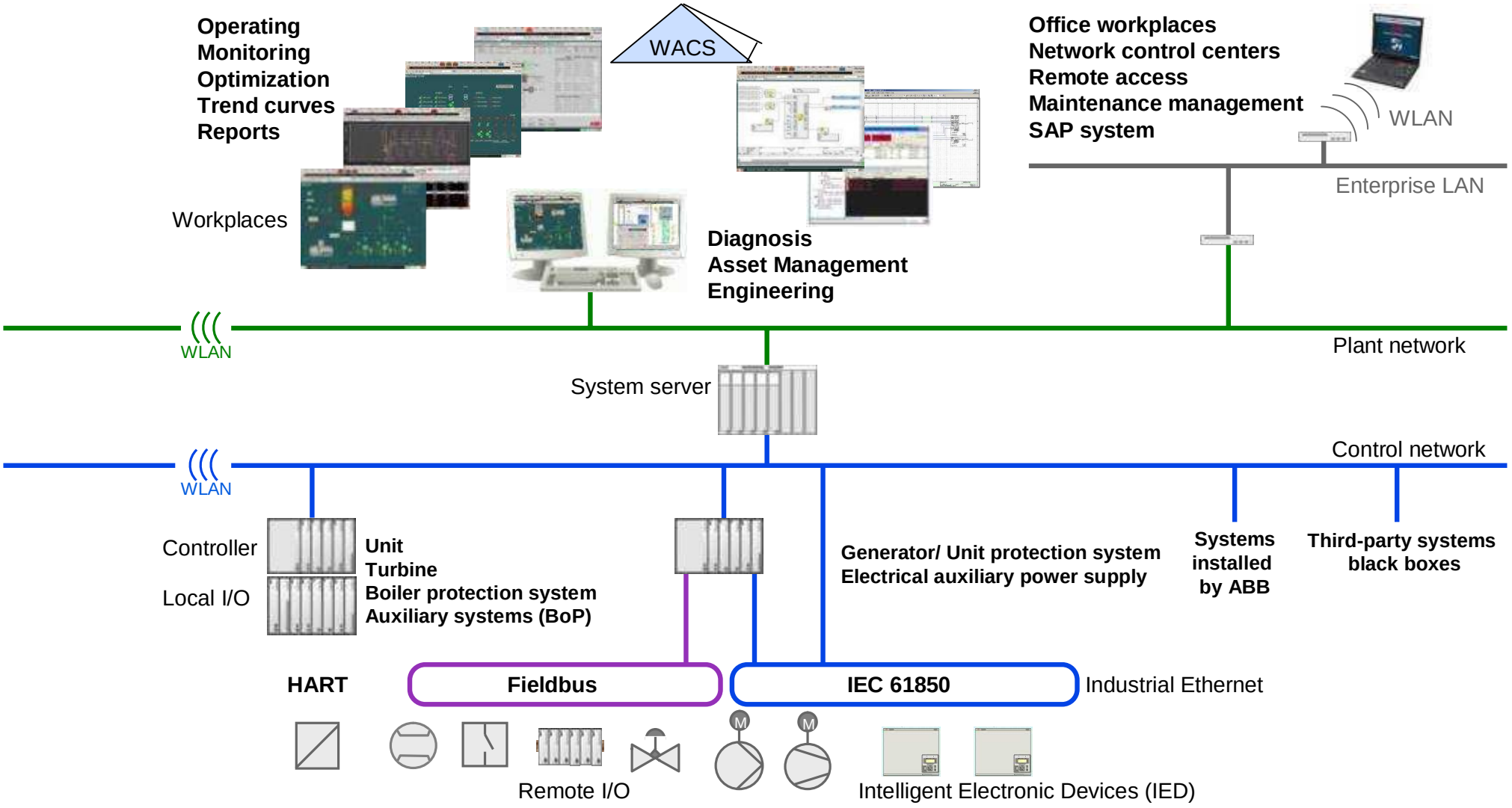


Waste-to-Energy
Excellence in electrical layout design



- 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

Waste-to-Energy
ABB DCS Systems – consistent, integrated technology



Waste-to-Energy
Benefits of modern plant control

Waste to energy plant targets ⟷ **Control system solutions**

- Increase revenues with
  - Waste throughput
  - Steam flow rate
  - Ash quality
- Reduction of operational cost
  - Less Manpower
  - Maintenance cost
  - Better Ergonometry
- High availability
  - Less trips by protection intervention
  - High DCS reliability

- Performance optimization
  - Degree of automation
  - Advanced control solutions with WACS modules for optimization
  - Total plant DCS
- Optimized redundancy
  - 2 out of 3 protection (SIL)
  - Detailed and fast diagnosis
  - Hot replacement
- Scalable HW and SW systems
- Evergreen concept
- 61850 Interface to HV/MV Switch gear

Waste-to-Energy
Instrumentation and Emission Monitoring (CEMS)

All from one competent supplier

Various applications:

- Differential / absolute gauge pressure
- Flow / level measurement
- Temperature measurement
- Flue gas / water and steam analysis

Wide choice of seals and orifices

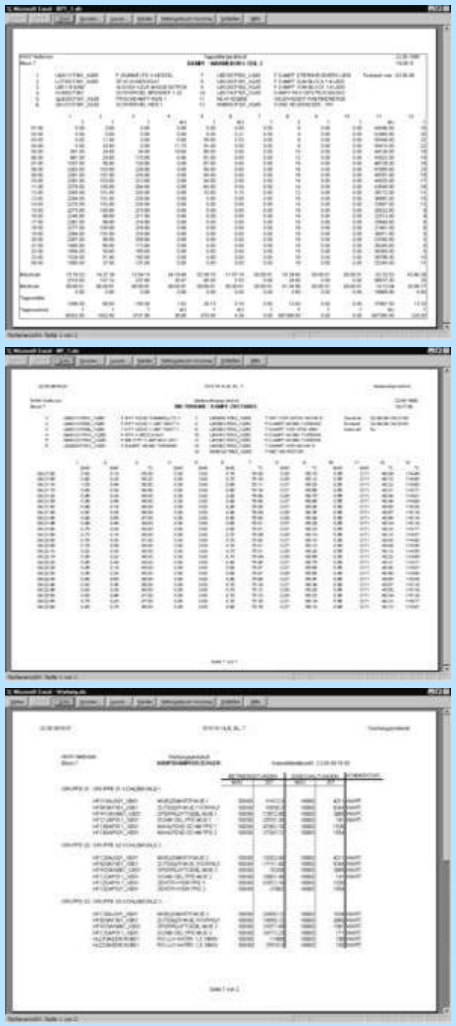
High reliability

Low maintenance (SMART transmitter)

Transmitters with

- Fieldbus (Fieldbus Foundation™ PROFIBUS®)
- HART protocol
- 4 - 20 mA

Waste-to-Energy
Reports for plant management support



Balance reports

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

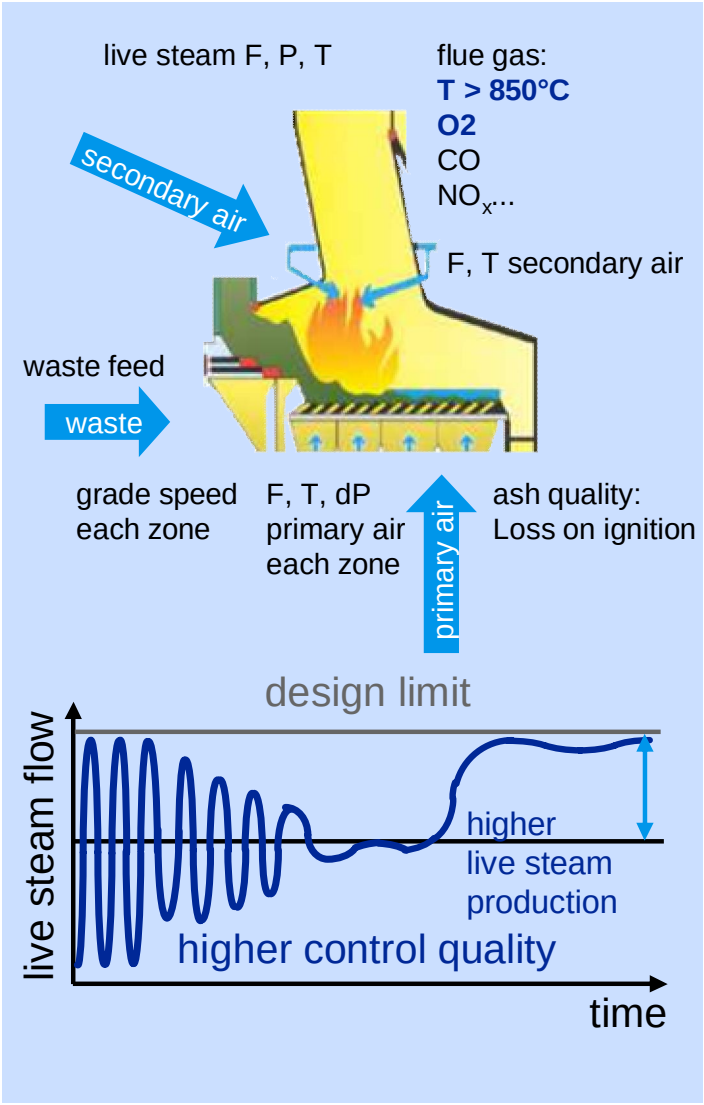
Trend reports

- 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

Waste-to-Energy
WACS - Advanced Combustion Control & Optimization



Multi-objective optimization thanks to Model Predictive Control technology (PMC)➔ Operation Mode Selection

- Optimization of excess oxygen level (**O_2**)
- Specific energy increase
- Reduction of emissions and better waste burnout (slag / ash with min. **TOC** content)

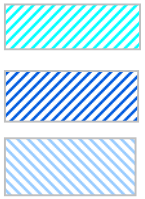
Protect the system from constraint violations

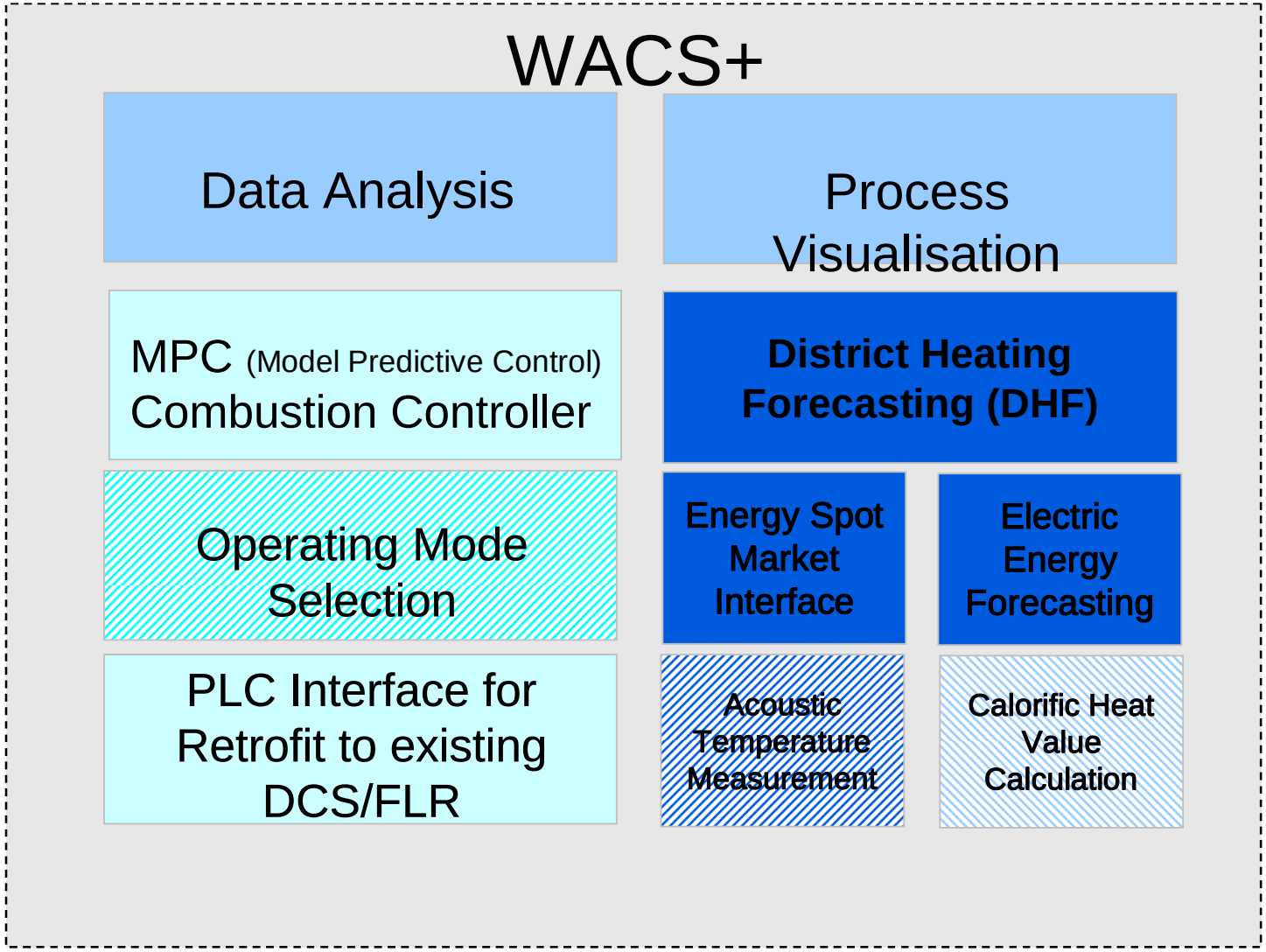
- Operative constraints on fuel, air consumption, flue gas reactant

Plant dynamics are integrated in the model, which results in smoother control of the process, reduced steam flow rate variations and temperature fluctuations.

Waste-to-Energy
WACS+ Overview of Optimization Modules

Future Options:





Waste-to-Energy
SYSAV Malmö, (Sweden)

- **Customer: SYSAV Malmö, Schweden**
- **Year of commissioning: 2003**

Business case

- New incineration line commissioned 2004
- Waste throughput: 25 t/h
- District heat production: 63 MW
- Electricity production: 26 MW

ABB solution

- Solution with full ICE scope of supply (Instrumentation, Control and eBoP)
- Integration of 3rd party Maintenance Management System (CMMS)

Customer benefits

- Technically advanced and highly automated plant
- Real-time plant information data available for operators
- Optimal operator efficiency and cost efficient use of resources

Waste-to-Energy
Infraserv Hoechst, (Germany)

Infraserv Hoechst, DE-Frankfurt

Enduser: Infraserv GmbH, Industrialpark, DE-Höchst

Customer: Ebara Corporation, Japan

Year of commissioning: 2010

Business case

- 3 lines of fluidized bed incinerators for the efficient and environmental friendly combustion of Refuse-Derived Fuel (RDF) for the clean energy production of an Industrialpark
- This combined heat & power station (CHP) efficiently incinerates 675’000 tpa of RDF fuel for the generation of a remarkable 73 MW electriacl power, district heating and process steam on the Industrialpark.

ABB solution

- Complete ICE package (Instrumentation, Controls, eBoP/Electrical)
- Transformers, HV, MV and LV switchgear, Protection
- MNSiS system for low-voltage MCC applications
- ACS800 Drives with “low harmonic kits”
- DCS control system 800xA with Profibus connection and Emission Monitoring System (CEMS)

Customer benefits

- Totally integrated and compatible full scope solution
- High degree of standardization prepared for later integration of CMMS system

Waste-to-Energy
RABA Südwestthüringen, Suhl (Germany)

- **RABA Südwestthüringen, Zella-Mehlis, Germany**
- **Enduser: Zweckverband für Abfallwirtschaft Südwestthüringen (ZASt), Zella-Mehlis, Germany**
- **Customer: Martin GmbH, Germany**
- **Year of Commissioning:2008**

Business case

- New, modern single line waste to energy plant (WtE) with a capacity of 21 tph for the generation of 14 MW_{el} or 8.2 MW_{el} and 30 MW_{th} extraction for district heating

ABB solution

- Complete ICE package (Instrumentation, DCS Controls, eBoP/Electrical) together with the WSC (water steam circuit) including Turbine-Generator
- Transformers, HV, MV and LV switchgear, Protection
- MNSiS system for low-voltage MCC applications
- Control system 800xA with Profibus connection and Emission Monitoring System (CEMS)
- ACS800 Drives with “low harmonic kit”
- Newly developed incineration controller WACS 300 with operating mode selector

Customer benefits

- Fully integrated solution out from one hand for minimal consumption of consumables which allows the future extension with a CMMS system

Power and productivity
for a better world™