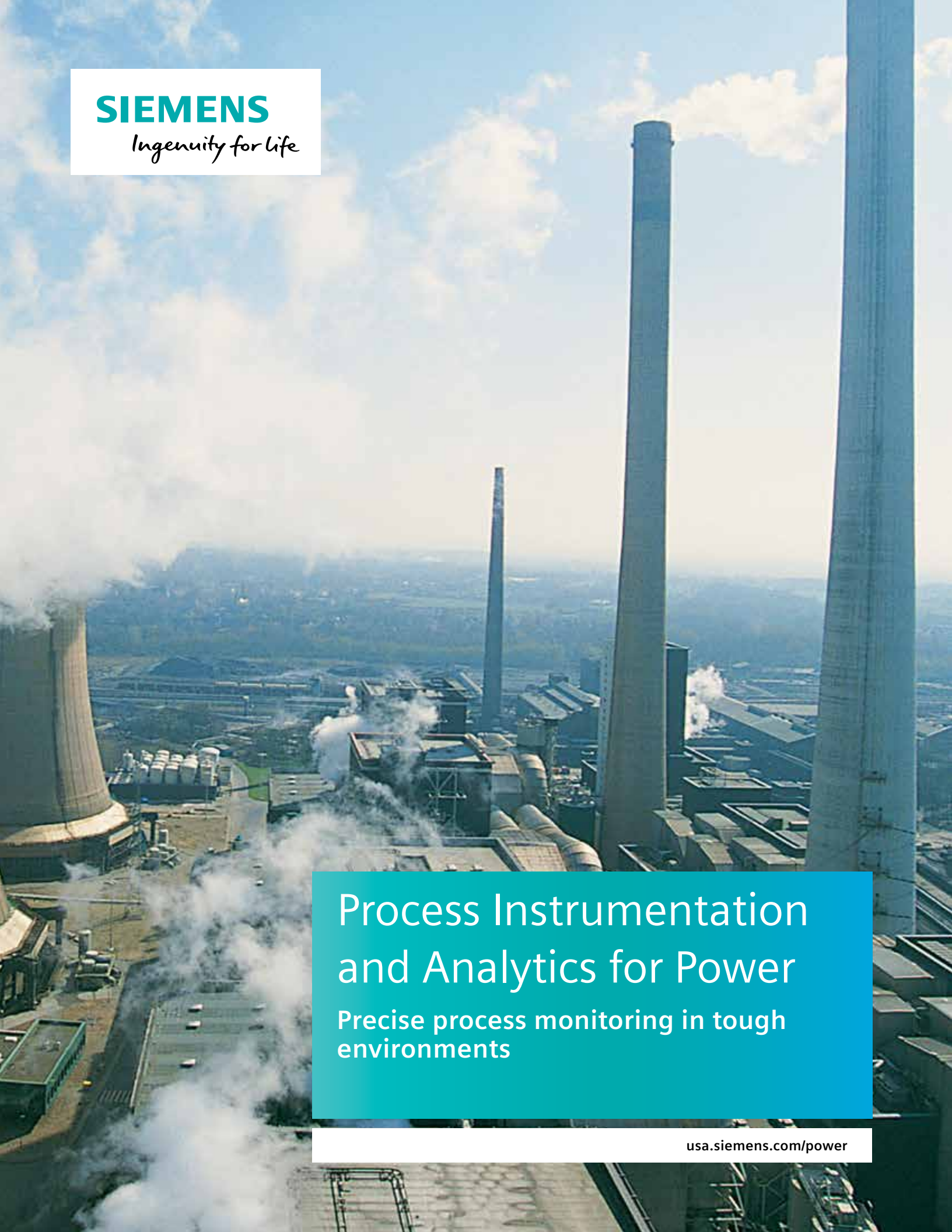


SIEMENS

Ingenuity for life

Process Instrumentation and Analytics for Power

Precise process monitoring in tough environments

usa.siemens.com/power

Reliable and precise process monitoring

Siemens has extensive and in-depth experience of the power industry. Our process instrumentation and analytics portfolio gives you the precision and integration into the automation system you need to ensure the best efficiency, reduced emissions, energy optimization and safety, whether you are modernizing existing operations or developing new facilities.

Siemens instrumentation and analytical products help power producers to efficiently adapt to the ever increasing energy demand and also incorporate the flexibility needed to support renewable green energy.

Process control is integral to plant safety and environmental compliance. Partnering with Siemens provides the reassurance of best-in-class products to help you deliver optimum performance and productivity.

Our technology matches to the rigors of power generation where high temperatures and pressures are common place. Reliability in arduous applications is paramount and Siemens products are designed to meet the challenge.

Optimize power generation whilst decreasing operating costs and downtime through:

- Precision measurement for critical application management
- Reliable devices for safe and efficient power generation

Ensure environmental compliance and lowest emissions by:

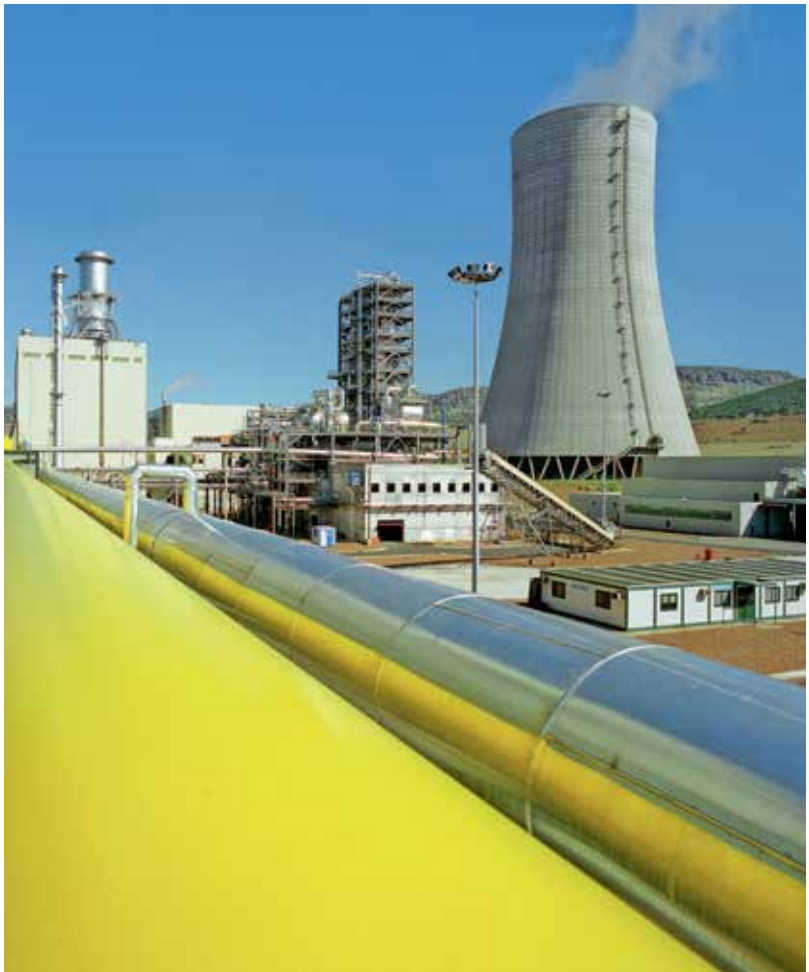
- Intelligent process control for optimal flue gas treatment and CO_2 reduction
- Continuous emission monitoring systems

Enhance safety and security using:

- SIL standard instrumentation giving tighter control and improved safety
- Smart instruments reducing the need for field maintenance and keeping workers safe

Comprehensive portfolio to match your needs

Whether in energy from waste, coal-fired, combined cycle or other power plants, we have process instrumentation and analytic solutions to match your needs. The following pages provide you with information to select the best device for your application. To find information about all our application solutions including interactive process charts, visit: www.siemens.com/sensors/power



Coal-fired power plant

1 Coal bunkers stock supervision

For economic fuel management, continuous supervision of the coal stock is essential. Non-contact, high-frequency radar technology offers a reliable and accurate solution for level measurement in harsh, dusty environments.

Preferred device: **SITRANS LR560**

- High-frequency 78 GHz FMCW non-contacting technology ensures reliable operation in dusty environments up to 100 m range
- Lens antenna eliminates large parabolic or horn antennas, providing a narrow 4 ° beam angle
- Unaffected by changing coal characteristics
- Reduced maintenance through integrated purge connection for easy cleaning of heavy buildup without removing the sensor

www.siemens.com/sensors/coal1

2 Pulverized coal flow detection

Pulverized coal is pneumatically conveyed to the burner through distribution lines. To ensure coal is routed correctly and steadily flowing, monitoring needs to be in place. Early detection of line blockage allows prompt remedial action.

Preferred device: **SITRANS AS100**

- Flow detection through non-invasive sound detection
- Easy mounting and maintenance through multiple mounting options such as screw in, bolt on, weld, or bond in place
- Continuous coal flow detection with high sensitivity and fast reaction time

www.siemens.com/sensors/coal2

3 Gas analyzer for optimized burner control

Power plant efficiency requires continuous monitoring and optimizing of the combustion process. Optimal furnace control means continuously monitoring of either just O_2 or O_2 together with CO or even CO_2 concentration directly in the combustion chamber.

Preferred device: **ULTRAMAT 23 and OXYMAT 61**
Alternative device (in-situ): **LDS 6**

- Low installation costs of the ULTRAMAT 23 through multi-component design for measuring up to three IR active constituents and optional electrochemical cells for O_2
- OXYMAT 61 is an oxygen analyzer for standard applications
- LDS 6 is an in-situ real-time laser analyzer for minimum installation requirements and fast response
- No influence or delay due to gas sampling/conditioning
- Integrated self-calibration loop for minimal maintenance

www.siemens.com/sensors/coal3

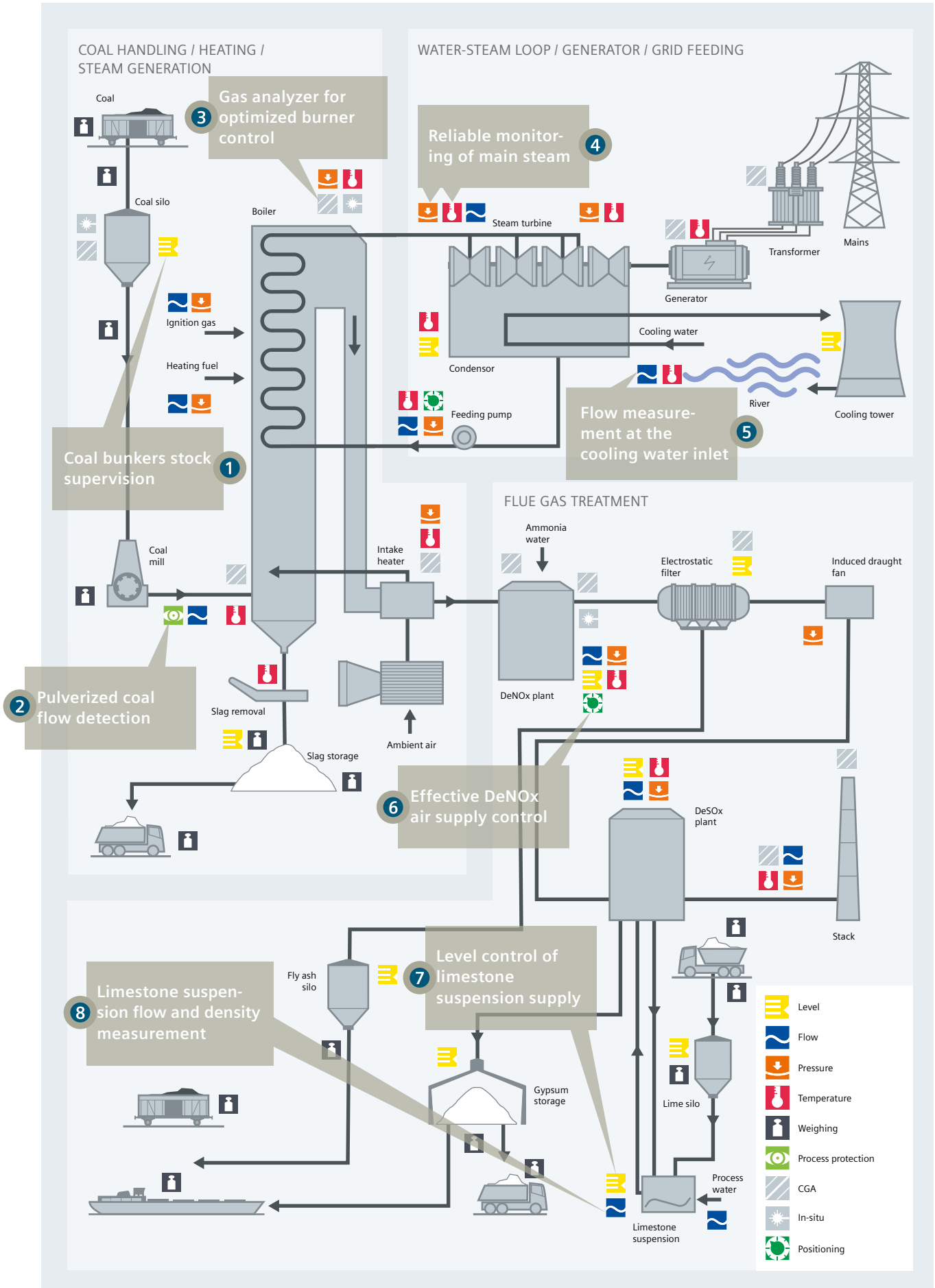
4 Reliable monitoring of main steam

Ultra-supercritical installations generate temperatures and pressures in excess of 600 °C and 250 bar. To ensure optimal performance it is vital that pressure and temperature in the water-steam cycle are monitored continuously and accurately.

Preferred devices: **SITRANS P DSIII and SITRANS T**

- Remote mounting capability of the transmitter allows isolation from high temperatures and vibration sources
- High pressure ranges combined with a robust transmitter for harsh applications
- Local display and local programming with push buttons, accessible without opening the enclosure
- Advanced communications, long-term stability and predictive maintenance functions enable extended maintenance cycles
- SITRANS P DSIII has high turndown ratio that allows one transmitter to cover a wide range of applications

www.siemens.com/sensors/coal4


COAL HANDLING / HEATING / STEAM GENERATION
WATER-STEAM LOOP / GENERATOR / GRID FEEDING
FLUE GAS TREATMENT
Coal
Coal silo
Boiler
Gas analyzer for optimized burner control
3
Reliable monitoring of main steam
4
Steam turbine
Transformer
Mains
Generator
Ignition gas
Heating fuel
Cooling water
Condensor
Feeding pump
River
Cooling tower
Flow measurement at the cooling water inlet
5
Coal bunkers stock supervision
1
Coal mill
Intake heater
Ammonia water
Electrostatic filter
Induced draught fan
DeNOx plant
Pulverized coal flow detection
2
Slag removal
Ambient air
Slag storage
Effective DeNOx air supply control
6
DeSOx plant
Stack
Fly ash silo
Level control of limestone suspension supply
7
Limestone suspension flow and density measurement
8
Gypsum storage
Lime silo
Process water
Limestone suspension
Level
Flow
Pressure
Temperature
Weighing
Process protection
CGA
In-situ
Positioning

5 Flow measurement at cooling water inlet

Sufficient cooling water flow strongly influences the performance of a power plant. Flow measurement has to cope with large pipe diameters, high water velocity and the risk of abrasion. Considering this criteria, non-intrusive, clamp-on flow measurement is the ideal solution.

Preferred device: **SITRANS FUS1010**

- Suitable for pipes up to 5 m diameter and larger
- Easily retrofitted as it is non-intrusive and can also be calibrated without stopping the flow
- Unaffected by changing characteristics of the medium
- Low maintenance costs due to external, simple clamp-on installation

www.siemens.com/sensors/coal5

6 Effective DeNOx air supply control

The DeNOx plant of modern units is characterized by a hot environment with high vibration. For sustainable NOx reduction, the ratio between air flow and ammonia is essential. A reliable solution for the control of air supply is to equip the pneumatic valve with the SIPART PS2 intelligent valve positioner and a remote-mounted non contacting sensor (NCS), keeping the positioner away from the harsh environment.

Preferred device: **SIPART PS2**

- The industry benchmark for linear and rotary valves, double- and single-acting actuators
- Easy retrofit with a variety of mounting options including remote mounting
- Simplified programming due to automated spanning capability
- Advanced diagnostics including predictive maintenance
- Extremely low air consumption

www.siemens.com/sensors/coal6

7 Level control of limestone suspension supply

Flue Gas Desulfurization (FGD) is typically used to remove SO_2 from the flue gas. Lime suspension is used as a reagent in FGDs, produces vapor, dust and deposits which can make measurement difficult. For efficient SO_2 removal, the reliable and steady supply of lime suspension in the FGD is vital. This can be achieved by non-contacting level measurement.

Preferred device: **SITRANS LR200**

- Continuous level measurement offers a cost-effective solution with a high immunity to buildup, vapor and condensation
- Process intelligence and Auto False-Echo Suppression as standard, giving superior performance in process vessels
- Low maintenance costs and reduced cleaning due to the non-contacting principle

www.siemens.com/sensors/coal7

8 Limestone suspension flow and density measurement

Density and flow of limestone suspension in flue gas desulfurization need to be measured to ensure a stable scrubbing process for efficient SO_2 removal. Using the coriolis principle for flow metering, both density and flow are available in one device, minimizing installation and maintenance costs.

Preferred device: **SITRANS FC430**

- Offers high accuracy over a wide range of flow rates
- Low life cycle costs due to multi-variable measurement in one device
- Advanced communications allow access to multiple process variables
- Easy retrofit due to the compact size

www.siemens.com/sensors/coal8

Combined cycle power plant

1 Steam drum level control

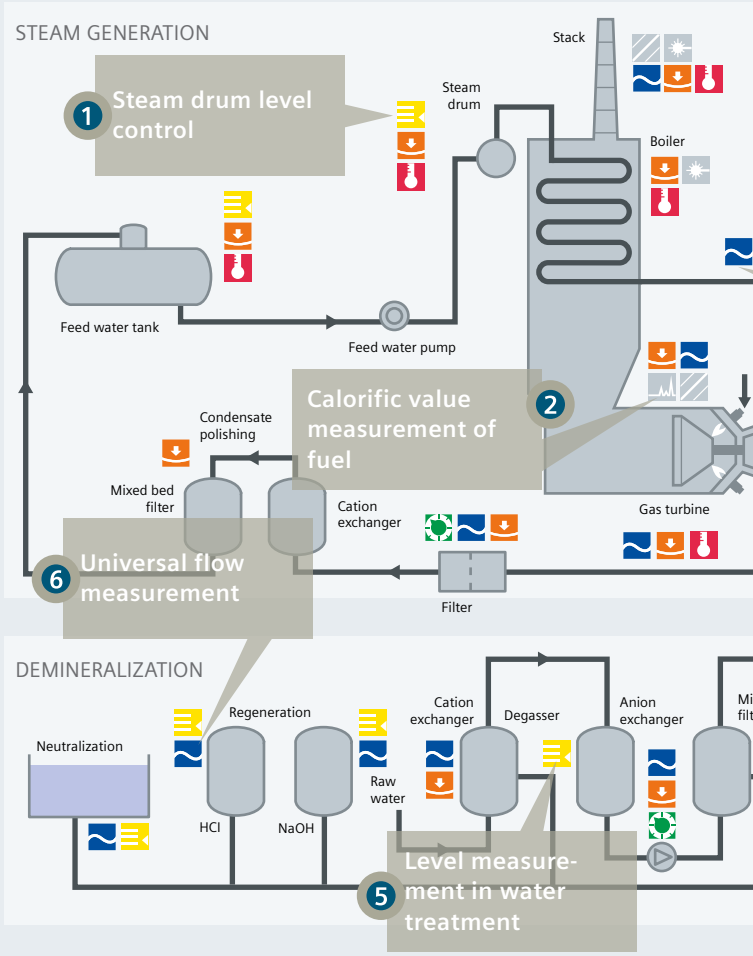
As a result of the fast-growing renewable energy generation, the demand for fast load changes in traditional power plants is significantly rising. Therefore a reliable drum level control is vital for ensuring the operation in all load cases.

A too low level will trip the boiler to avoid overheated boiler tubes, or a too high level can cause damage in the steam turbine through insufficient moisture separation within the drum.

Preferred device:
SITRANS P DSIII Differential pressure transmitter
Alternative device:
SITRANS LG200 Guided wave radar

- Standard devices offer comprehensive diagnostics and simulation functions with high reliability
- Suitability for use in SIL circuits and redundancy
- SITRANS LG200 measures accurately in applications of corrosive vapors, saturated steam with quick fill/ empty rates and vacuum
- Suitable for high pressure and temperature applications

www.siemens.com/sensors/combined1



2 Calorific value measurement of fuel

To provide optimum control of the gas burners, continuous information on natural gas quality and physical properties, such as calorific value and density, are required. Timely, accurate and reliable measurement of gas quality ensures a more efficient combustion process.

Preferred device: **SITRANS CV**

- High separation performance of gas components with low detection limits
- High linearity over the entire measuring range reducing the need for expensive calibration gases
- Mounted directly at the sample extraction point reducing the need for expensive shelters and sample conditioning

www.siemens.com/sensors/combined2

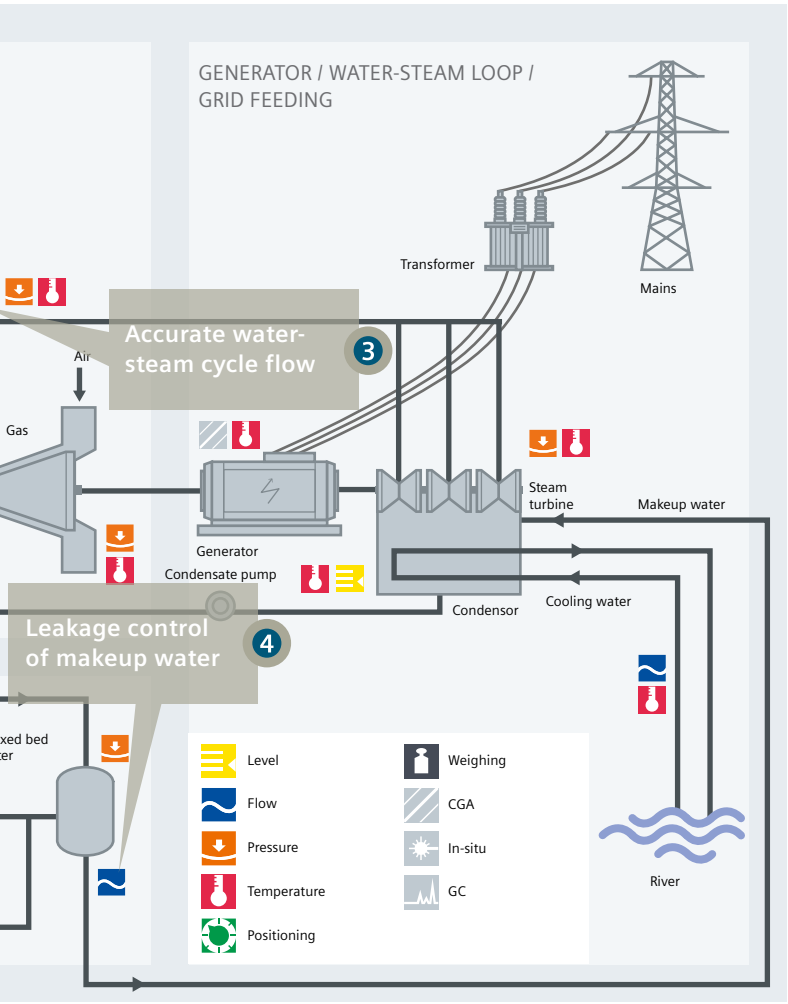
3 Accurate water-steam cycle flow

Steam flow is often measured using differential pressure (DP with an orifice plate as the primary element) or with a Vortex flowmeter because of high pressure and temperature conditions as well as the non-conducting nature of the medium.

Preferred device: **SITRANS FO Orifice flowmeter**
Alternative device: **SITRANS FX300 Vortex flowmeter**

- Orifice flowmeters are very robust and can be used in a wide range of pipe diameters
- Accredited to international standards
- No calibration required as system is standardized
- Remote mounting capability
- Vortex flowmeters provide three process variables in one device (flow, temperature, pressure)
- Easy installation
- System redundancy available with a dual transmitter version

www.siemens.com/sensors/combined3



4 Leakage control of makeup water

Power plants operate with high-quality demineralized water. It is used to feed the water steam cycle to make up for losses due to blow-down or sealing issues. By continuously monitoring the makeup water flow rate, abnormal conditions can be detected and operating costs can be controlled. Water is demineralized to remove impurities that will effect the process. Its characteristic low conductivity makes the ultrasonic flow principle the ideal choice.

Preferred device: **SITRANS F US SONO 3100/FUS060**

- Reliable flow measurement on non-conductive liquids
- Wide measuring range with high accuracy
- No pressure drop keeping system pressure standard
- Long-time stability
- Transducers can be replaced under pressure, reducing maintenance costs

www.siemens.com/sensors/combined4

5 Level measurement in water treatment

Complex water treatment systems are installed to supply the power plant not only with high-quality demineralized water, but also with service water for cleaning or for fire fighting in emergency cases.

Level measurement on inlets, basins, process vessels, pump stations, filter beds and storage tanks are all required to ensure the water supply of the plant.

Preferred device: **SITRANS Probe LU**
Alternative device: **SITRANS P200**

- SITRANS Probe LU is an entry-level 2-wire loop-powered ultrasonic transmitter for level and flow monitoring of liquids, providing cost-effective high performance
- The SITRANS P200 transmitter is a compact single-range transmitter for hydrostatic measurements of aggressive and non-aggressive media
- Price-effective compact units with easy installation and simple start-up

www.siemens.com/sensors/combined5

6 Universal flow measurement

The water treatment process contains many flow measurements e.g. raw water, chemical dosing, back washing. A universal flo meter with a large variety of liners and diameters ensures a perfect fit for almost every water application with a minimum of conductivity.

Preferred devices: **SITRANS F M MAG 3100 / MAG 6000**

- SITRANS F M MAG 3100 is an electromagnetic flow sensor with a large variety of liners, electrode material and with grounding electrodes as standard. All this ensures a perfect fit for almost every flow application
- The SITRANS F M MAG 6000 transmitter is engineered for high performance, easy installation, commissioning and maintenance. It is robust, suitable for general applications and can be fitted with communication modules

www.siemens.com/sensors/combined6

Energy from waste plant

1 Ensuring raw material fuel supply

Intake bunkers and cranes play a crucial role in modern energy from waste power plants. It is important that the continuous material handling system, from waste arrival, through separation, to combustion, is controlled effectively. Level measurement in bunkers and automated crane positioning both play a critical part in this process.

Preferred device: **SITRANS LUT400**

- Compact, long-range ultrasonic controllers for continuous level or volume measurement of liquids, slurries, and solids
- Fast and reliable response with integral digital override
- Low life cycle costs based on easy installation and fast commissioning
- Minimum spare parts due to compatibility with all Echomax® transducers

www.siemens.com/sensors/waste1

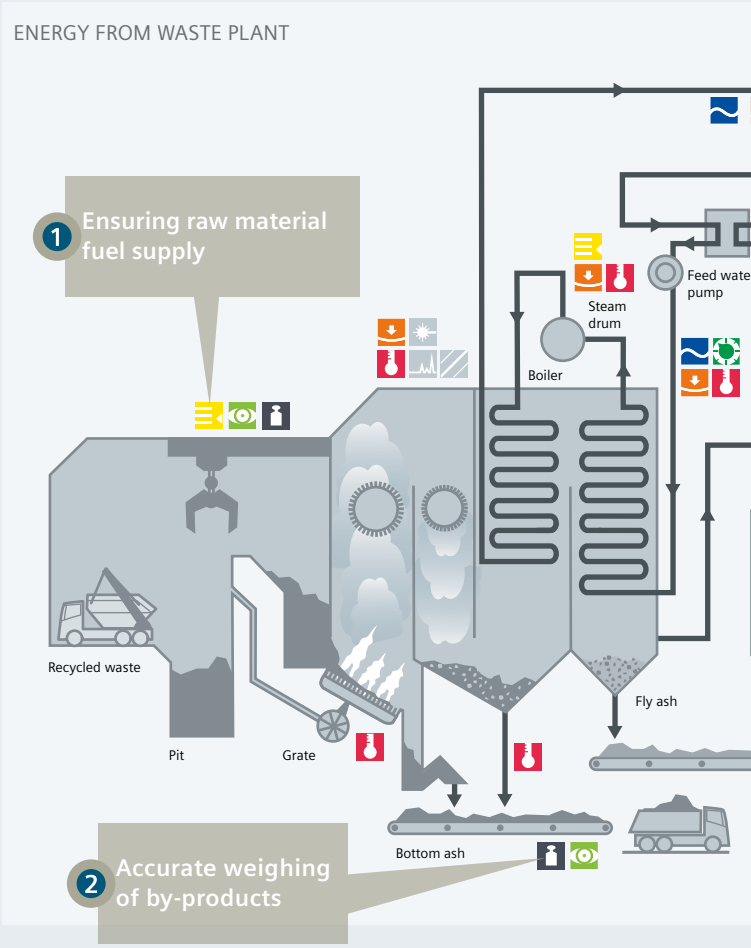
2 Accurate weighing of by-products

When using waste to generate energy, by-products such as ash, metals and aggregates are produced. To optimally manage these products, they are weighed in flight due to the continuous nature of the process. An accurate beltscale mounted on a conveyer provides the necessary information about the feed rate and total weight to enable resale.

Preferred device: **Milltronics MSI**

- 0.5 % accuracy with a single idler system
- Outstanding accuracy and repeatability
- Unique parallelogram style load cell design minimizes external mechanical influences
- Fast reaction to product loading; capable of monitoring fast-moving belts with light product loading
- Rugged construction, reducing maintenance needs

www.siemens.com/sensors/waste2



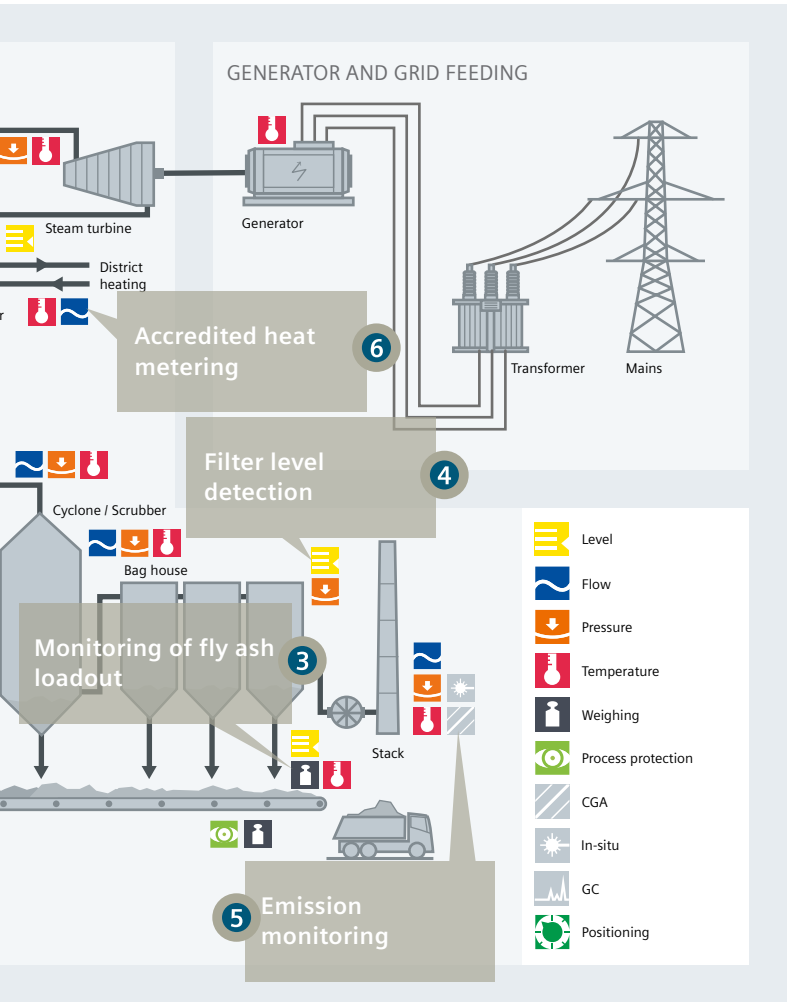
3 Monitoring of fly ash loadout

Fly ash is a valuable by-product from power generation and is often used as a cement substitute. Being able to accurately measure the bulk solid flow of fly ash with a solids flowmeter is critical to the downstream handling process.

Preferred device: **SITRANS WF330**

- Continuous monitoring of the material flow without interrupting the process
- Requires minimal maintenance or recalibration after the initial installation and material tests
- Performs in situations where other weighing devices cannot be integrated into an existing process: the compact size makes them easy to install without major modifications

www.siemens.com/sensors/waste3



4 Filter level detection

Bag filters and ESPs remove particulates from the flue gas prior to entering the stack. The particulates are deposited in the dust collectors below the filters. Collectors overfill often require manual labors to clear and will trip the flue gas cleaning process. Each collector is equipped with a high-level switch to automate the emptying process. For high reliability, the level sensors need to be resistant to high temperature and abrasion.

Preferred device: **Pointek CLS300**

- Unaffected by material buildup in the active shield section ensures reliable operation
- Operates in extremely abrasive conditions because of the solid rod construction reducing maintenance requirements
- High-temperature version for applications up to 400 °C
- Digital version: integral LCD display, and PROFIBUS PA communication

www.siemens.com/sensors/waste4

5 Emission monitoring

The Gasmet CEMS FTIR measuring system is designed for continuous emission monitoring (CEM). By use of Fourier Transform Infrared (FTIR) spectroscopic technology it typically monitors H_2O, CO_2, CO, NO_2, SO_2, HCl, HF, and NH_3 in emission gases.

Preferred device: **Gasmet CEM**

- A standardized emission monitoring system which reliably covers all requirements associated with sampling, sample preparation, and gas analysis
- It contains the Gasmet FTIR gas analyzer, an industrial computer and a sampling system, it may be enhanced with an optional ZrO_2 oxygen analyzer and/or a total organic carbon analyzer FIDAMAT 6
- Depending on the configuration, certified measurements according to European WID and LCPD guidelines as well as compliance to US EPA guidelines are supported
- The operation of the system is fully automatic and controlled by the Calcmet software ensuring reliability

www.siemens.com/sensors/waste5

6 Accredited heat metering

Frequently cogeneration of power and heat is found in energy from waste plants. Following power generation the exhaust steam supplies district heating systems via a heat exchanger. To ensure efficient performance, the monitoring of the heated water flow is the key process for metering delivered thermal power. The ability to accurately monitor and control water flow and derive energy usage is paramount for optimal operation.

Preferred device: **SITRANS FUE380**
Ancillary device: **SITRANS FUE950**

- SITRANS FUE380 is a high-performance ultrasonic flowmeter ideal for high-volume water-based applications
- Available in a wide range of sizes and approved for custody transfer
- Low maintenance costs due to proven measuring principle and welded construction
- SITRANS FUE950 is a universal custody transfer approved energy calculator, designed for use in cooling / heating applications

www.siemens.com/sensors/waste6

A comprehensive portfolio for all applications

Siemens process instrumentation and analytics has a comprehensive, proven product portfolio suitable for arduous environments. This overview shows the entire spectrum of our process instrumentation and analytics portfolio for the power industry.

Level

Whether you are measuring liquids, slurries or bulk solids, Siemens provides the right level measuring technology for both continuous and point level measurements. Regardless of the application, we provide the optimum solution, whether the technology is radar, ultrasonic, capacitance, electro-mechanical or hydrostatic pressure. One of our product highlights is the SITRANS LR560, which is the ideal solution for level measurement in coal bunkers and dusty environments.

Weighing

The comprehensive Siemens weighing portfolio includes beltscales, weigh-feeders, solids flowmeters and static weighing. Our SIWAREX PLC-based weighing electronics also allow direct integration into the Siemens range of PLCs, providing unparalleled flexibility and ease of use. Milltronics MSI beltscales are the preferred solution for accurate weighing of by-products.

Flow

Our flowmeters meet the toughest challenges and are available for a wide variety of applications. Highly accurate and reliable, they measure and monitor flow rates of gas, steam and liquids with varying consistencies. Technologies include electromagnetic, ultrasonic, coriolis and vortex.

Pressure

Siemens offers a comprehensive range of devices for pressure measurement – relative, differential and absolute. The outstanding accuracy, robustness and ease-of-use make these instruments the preferred choice.

Temperature

Siemens temperature measurement devices offer you a comprehensive solution. They are designed to support all common RTDs, thermocouples, resistance and millivolt sensors. The range covers head, rail and field transmitters and includes industry-specific sensors to match all common applications.

Process protection

A wide range of rugged and reliable process protection devices. SITRANS AS100 acoustic sensors help operators detect blockages in pneumatic conveying systems, while our motion sensor range ensures that mechanical conveying systems maintain their set speed – informing operators in the case of breakdown or failure and helping to increase availability.

Positioner

The electropneumatic valve positioner SIPART PS2 offers easy integration, as well as extensive diagnostic functions and minimum loss of process air by only using air when required. This enables operators to gain cost-effective and accurate control over typical applications.

Gas analysis

Siemens offers a comprehensive range of products and systems for process analytics. It includes in-situ and extractive continuous gas analyzers for stand-alone and system solutions, as well as process gas chromatography.

WirelessHART communication components

Our WirelessHART portfolio includes battery-powered transmitters, adapters as well as a gateway. With our WirelessHART solutions, users profit not only from lower total cost of ownership but also from significantly improved process diagnostics, productivity and security.

Measuring everything that matters:
usa.siemens.com/pi

Siemens Process Instrumentation offers best-in-class measurement and seamless integration into your automation system. We are the total solution provider for flow, level, pressure, temperature, weighing, positioners and more.

Follow us on:

twitter.com/siemenssensors
facebook.com/siemenssensors
youtube.com/siemens

Siemens Industry, Inc.
Process Industries and Drives
100 Technology Drive
Alpharetta, GA 30005
1-800-365-8766
info.us@siemens.com

Subject to change without prior notice
Order No.: PIBR-A280-1019