


## MID related applications in the Power Generation Industries

Vermindering van de CO2 footprint, meetefficiency is de basis



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1. Intro and addressable Industries
  2. Energy Transition - Legal background
  3. Applications & Products
  4. Our focus & approach

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# Even voorstellen

- Wil Menninga
- Key Account Manager
- 26 yrs at KROHNE different positions



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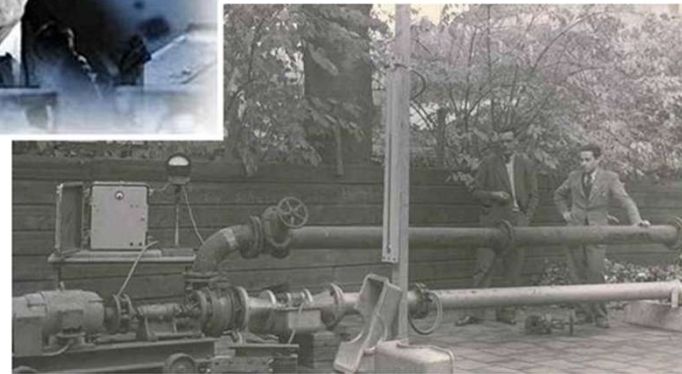
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## KROHNE

Once upon a time...



1921



1953



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- Founded 1921 in Duisburg, Germany
- 100% family-owned
- 2021 turnover: 652.4 MEUR (incl. joint ventures)
- >4,100 employees
- >350 employees in R&D
- 16 production facilities in 11 countries
- Local presence in over 100 countries



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## Power Generation

Power Generation within the KROHNE Group



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# Reducing the CO2 Footprint EUROPE – Which systems are in place?

EED  
2012/27/EU



Efficiency measures

EU-ETS  
2018/410/EU



Give CO2 a price



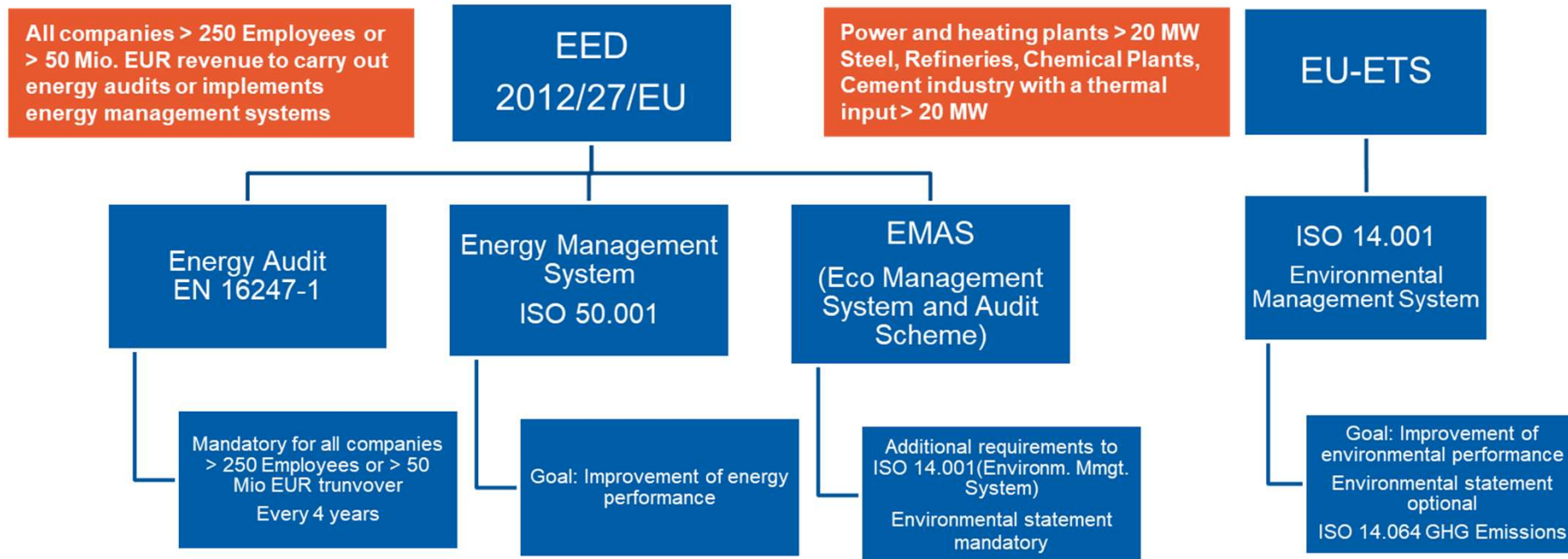
Legislation and cost pressure as the main project drivers



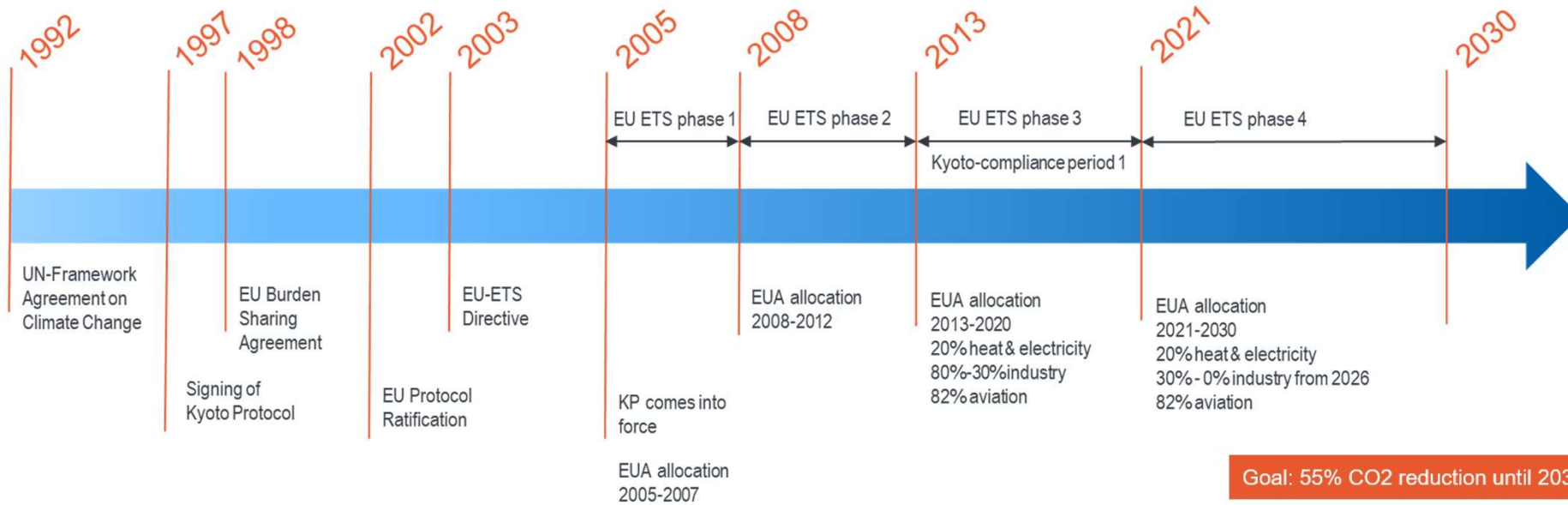


# Reducing the CO2 Footprint

Which regulations exist and what are companies obliged to?



# Reducing the CO2 Footprint Regulations – Timeline EU ETS



ETS: Emission Trading System

EUA: European Allowances



# Reducing the CO2 Footprint

## Regulations – Timeline EU ETS

There are two main types of carbon pricing: **carbon taxes** and **emissions trading systems (ETS)**. A carbon tax sets a price on carbon by defining a tax rate on greenhouse gas emissions or, more commonly, on the carbon content of fossil fuels. An ETS establishes a market price for CO<sub>2</sub> emissions. Per figure 2 there are currently 64 carbon pricing schemes in place, covering slightly over 21% of global GHG (Green House Gases) emissions.

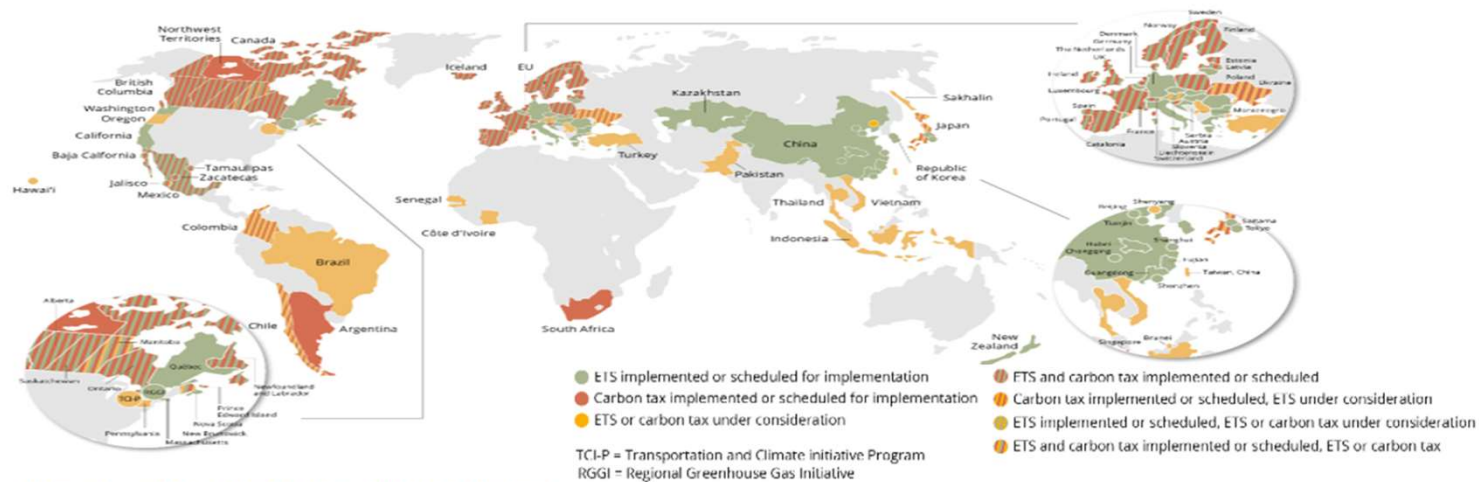


Fig. 2 – 2021 Map of carbon taxes and emissions trading

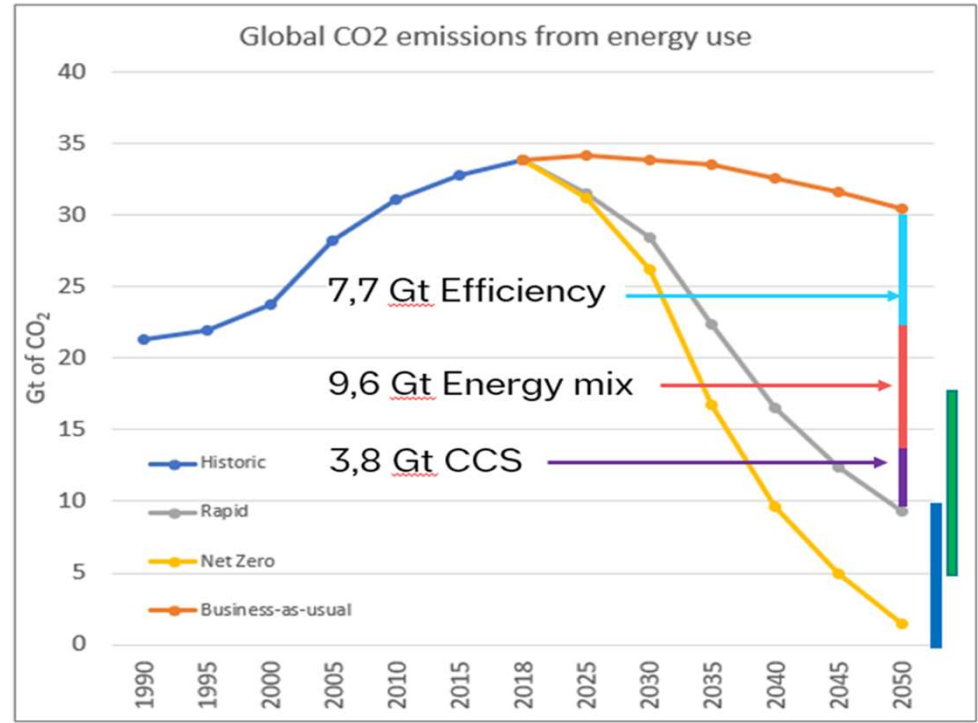


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# Reducing the CO2 Footprint

## Kyoto protocol, Paris agreement and EU-ETS

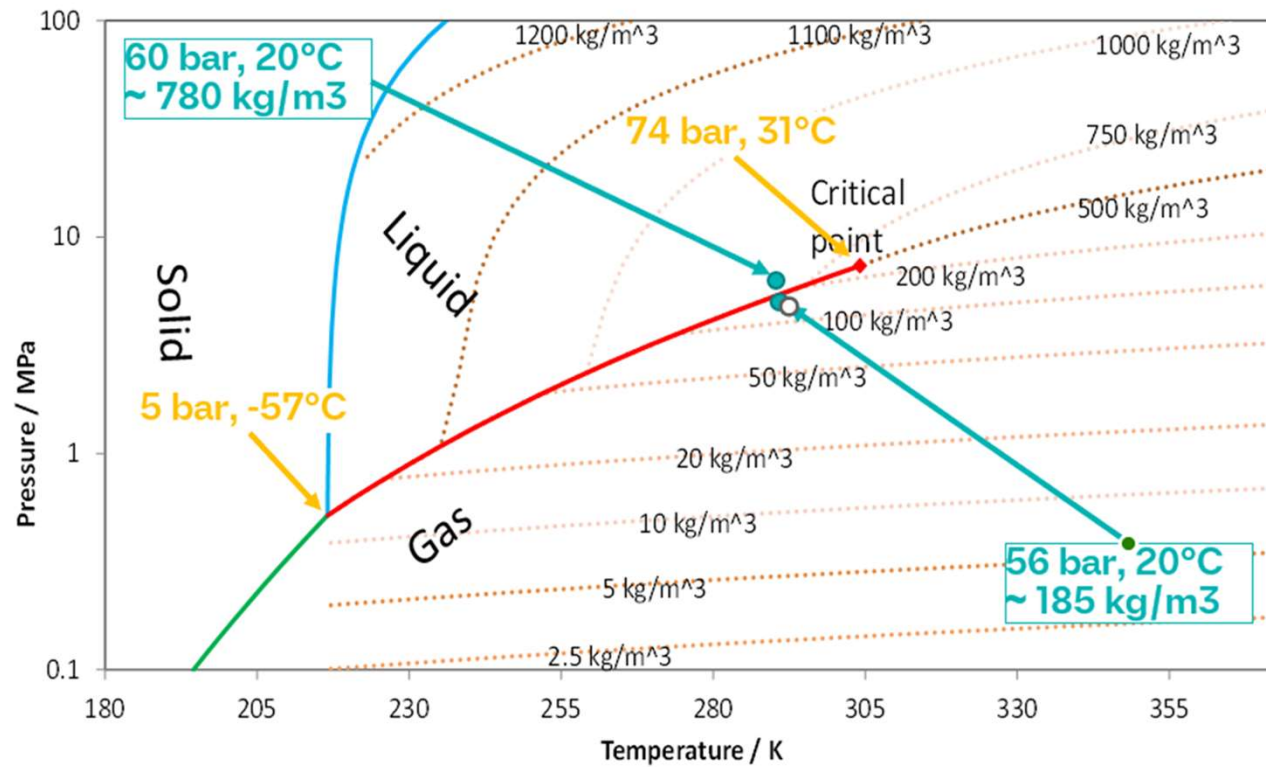


Source: BP Energy outlook 2020



# Reducing the CO2 Footprint

## Challenges in measuring CO<sub>2</sub>



# Reducing the CO2 Footprint

## Guide for Implementation of a Management System



## Measuring Instruments Directive Relevant MID,s in Power Generation

### Main objective of the MID: „Protection of the consumer“

Sale of electricity, heat etc. to end customers

### ... but the MID applies in many other cases

Standard in the industry between parties for transfer of goods (Fuel, refined products, heat, cold)

Reference for payment of subsidies > CHP act

Referenced in regulations EED and EU-ETS and reporting standards



Measuring Instruments Directive 2014/32/EU



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## Measuring Instruments Directive

### Relevant MID,s in Power Generation

MID	Description	Applications in Power
MI-001	Water meters	Water (clean cold or hot water)
MI-002	Gas meters and volume conversion devices	Fuel gas
MI-003	Active electrical energy meters	Electricity production
MI-004	Heat meters	Heat production in form of hot water
MI-005	Liquids other than water	Fuel oil
MI-006	Automatic weighing instruments	Belt scale for solid fuels
MI-007	Taximeters	
MI-008	Material measures	
MI-009	Dimensional measuring instruments	
MI-010	Exhaust gas analysers	

→ Not applicable

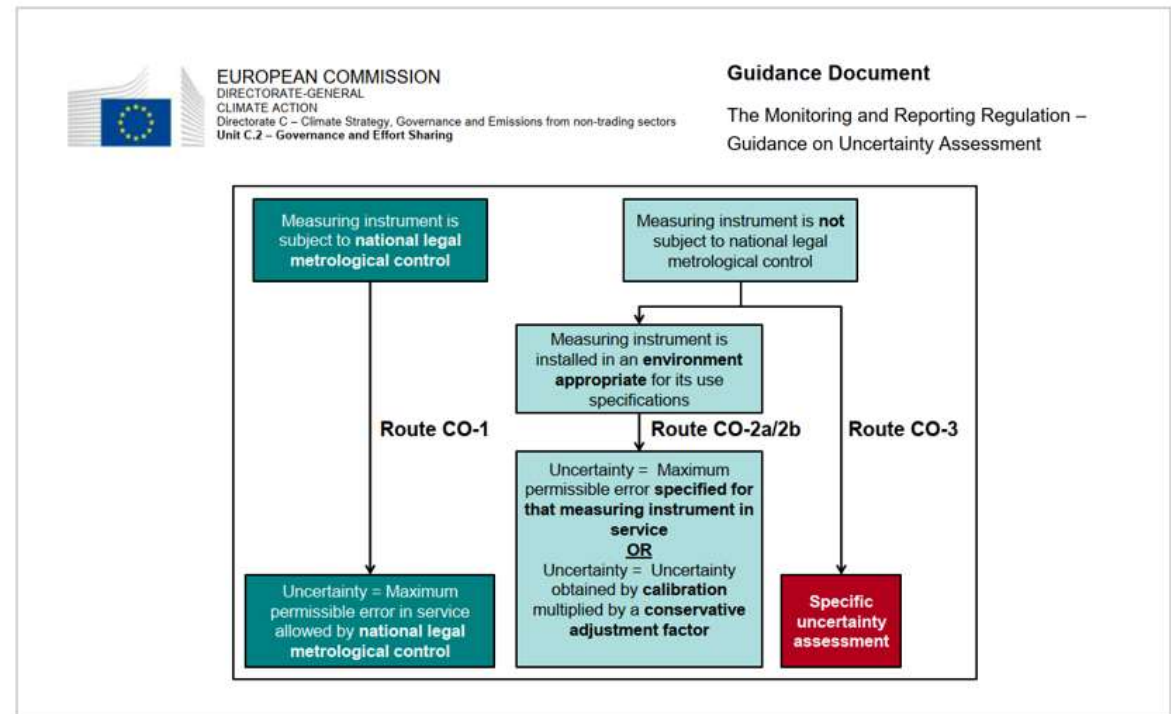
→ In some projects also applied for condensate, but not compliant





## Measuring Instruments Directive Example Guidance Document – Monitoring and Reporting

- EU-ETS European Emission Trading Scheme
- Commission Implementing regulation 2018/2066/EU (monitoring/report GHG)
- Uncertainty analysis required
- Reference to MID (2014/32/EU) (MI appl)
- MPE in service = MPES is usually 2 x MPE



Undoubtful uncertainty for MID - applications



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# Energy Transition

## 01 Greenhouse-Gas Emissions

### GHG Monitoring/ Reporting Project

Implemented within ISO 14.064

Manage eco footprint measure/reports

Consider carbon credits



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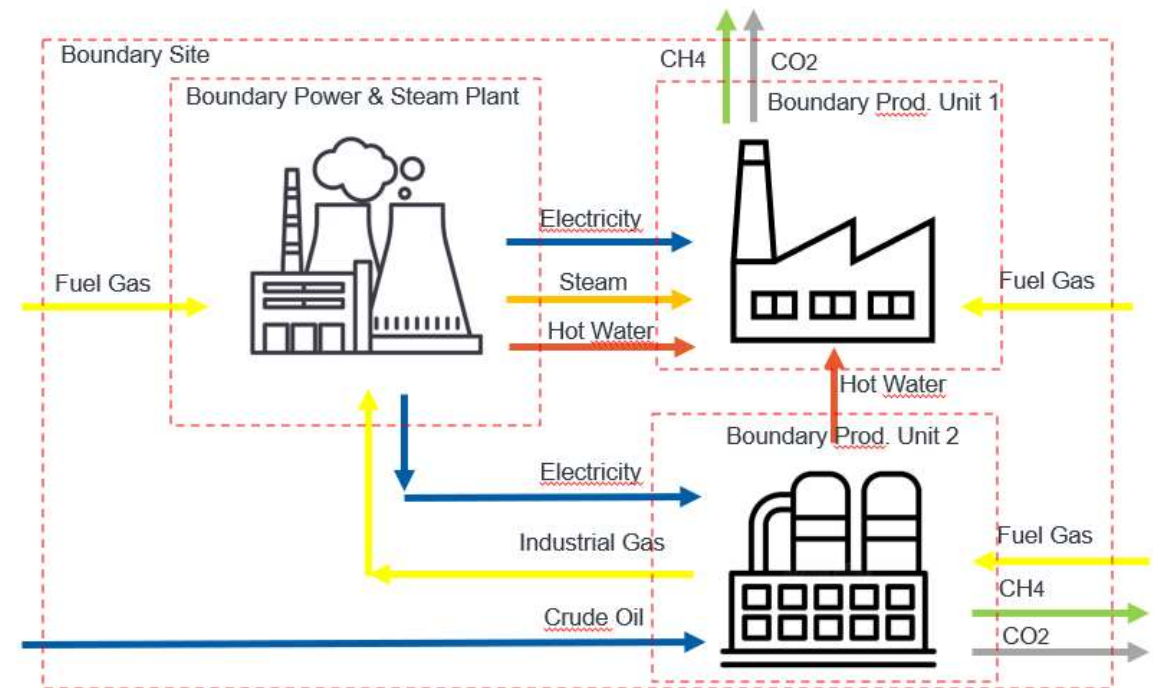
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## Energy Transition

### 01 Greenhouse-Gas Emissions

#### Measurement of GHG relevant energy flows

- Fuels
- Heat (steam)
- Heat (hot water)
- Cold (chilled water)
- Raw products
- Finished products (e.g. refined products)
- Direct emissions



## Energy Transition

### 01 How to deal with steam?

- Steam not covered by MID in the most member states
- The uncertainty in service according to implementing regulation/ guidance document must be assessed
- Uncertainty assessment for the whole application covered by ISO 5167 (dp measurement)

Nr.	Geräteart	EU-Richtlinie	Fehlergrenzen	Verkehrsfehlergrenzen	Eichfristen
7	Wirkdruckgaszähler Messaufnehmer		Für Wirkdruckgaszähler (Gesamtgerät) ist keine Fehlergrenze festgelegt. Es erfolgt eine Unsicherheitsbewertung gemäß DIN EN ISO 5167.	Das Doppelte der FG für den Messaufnehmer	2 Jahre ohne Filter 4 Jahre mit Filter
	Wirkdruck (Differenzdruck)		0,3 % (vom Endwert)		
	Dichte (Betriebszustand)		0,5 %		
	Dichte (Normzustand)		0,5 %		
	statischer Druck für die Dichtebestimmung		0,5 %		
	Durchflusskoeffizient C		1,2 %		
	Temperatur		0,5°C		

### Leitfaden zur Erstellung von Überwachungsplänen und Emissionsberichten für stationäre Anlagen

4. Handelsperiode (2021–2030) des europäischen Emissionshandels

Umwelt Bundesamt

DEHSt  
Deutsche Emissionshandelsstelle



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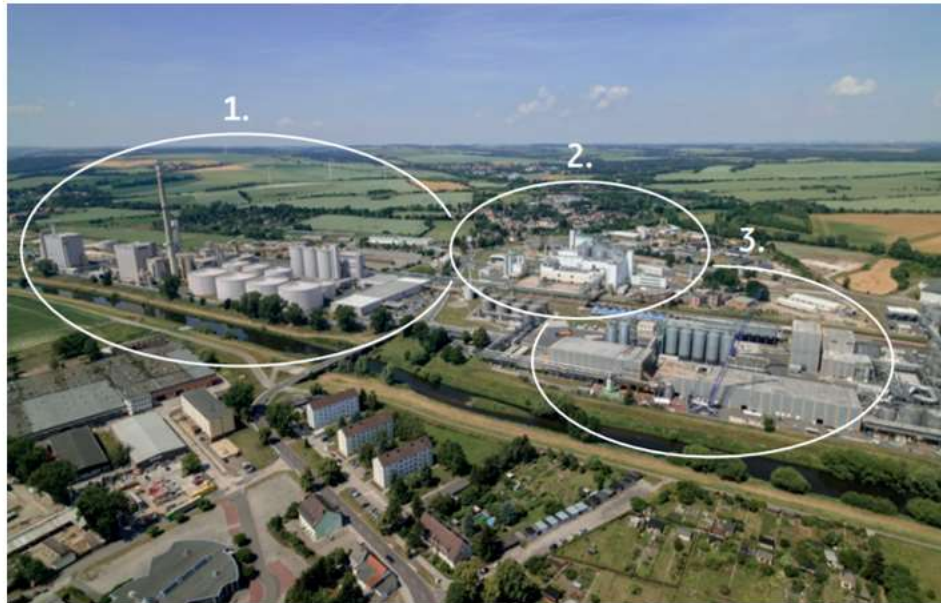
## Energy Transition

02 Case study Corporate Carbon Footprint Project at Südzucker Zeitz

### Südzucker AG, Site Zeitz

#### One site, different facilities

1. Sugar factory
2. Wheat starch plant
3. Bio-ethanol plant
4. with CO2 liquefaction plant



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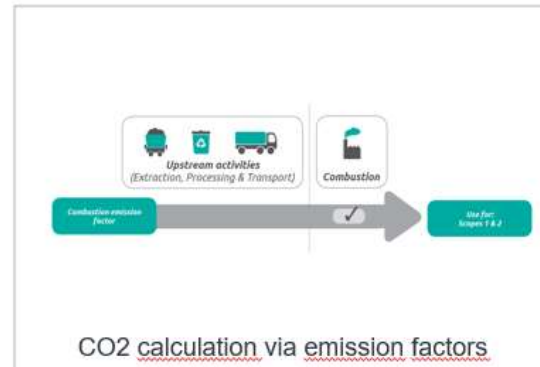
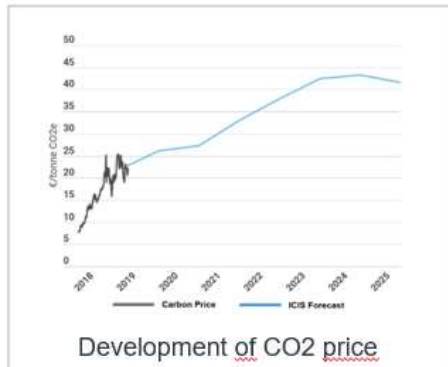
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# Energy Transition

## 02 Case study Corporate Carbon Footprint Project at Südzucker Zeitz

### ISO 14.064

- Corporate Carbon Footprint
- GHG- emissions will be accounted according to the boundaries
  - Operational boundaries
  - Financial boundaries
- Combustion emission factor > distribution of CO2 price per ton of steam > distribution of CO2 across the different production plants



## Energy Transition

### 02 Case study Corporate Carbon Footprint Project at Südzucker Zeitz

#### Project background

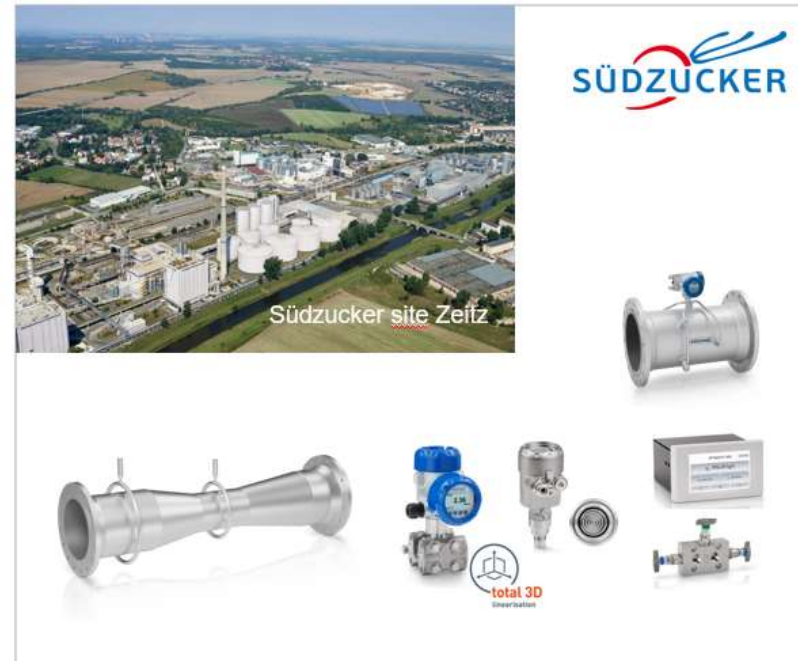
- Südzucker operates a sugar factory, a bio ethanol plant and a starch plant at their Zeitz site. The corporate carbon footprint should be accounted for every single production unit. The project was conducted according to ISO 14064

#### Products applied

- 3 complete Venturi DP-flow metering solutions.
- 1 ultrasonic flowmeter for hot water (MI-004)

#### Customer Benefits

- Full one-stop-shopping solution for the energy flows
- Venturi DP-flow for steam flow measurement in confined spaces
- Energy efficient, low remaining pressure loss
- Only short straight pipe sections for installation required





## Energy Efficiency

### 03 Example: Decarbonization of DH - Network

#### District heating is an important pillow on the pathway to net zero

New/ additional DH networks & pipelines  
 Decarbonization of existing DH networks

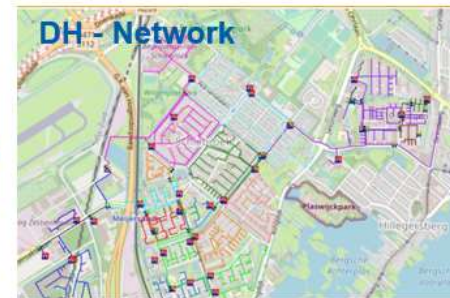
#### Heat source

- Data center
- Industrial waste heat
- Geothermal
- Solar thermal
- Other sources: e.g. CHP  
 Biomass plant



#### Service company

- Operates heat pumps & infrastructure
- Sells heat to end customer or grid operator



## MID and Heat Metering in Europe

### 03 Application Example

#### Project

A CHP plant sells energy in form of hot water to its customer. A new pipeline and a new measurement system should be installed for this purpose.

#### Background

#### Preconditions

Amongst others one pipe branch of 700 mm needs to be measured.

The flowrate in summer and wintertime differs by the factor of 5. The flow profile is disturbed at the available installation point by two elbows out of plane.



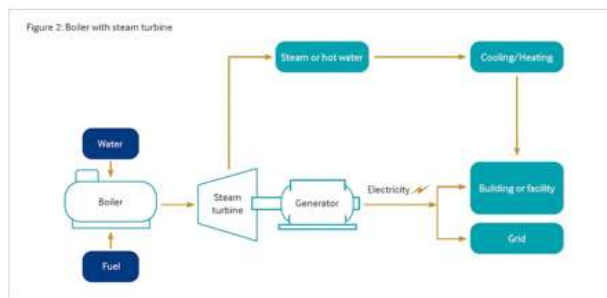
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## MID and Heat Metering in Europe

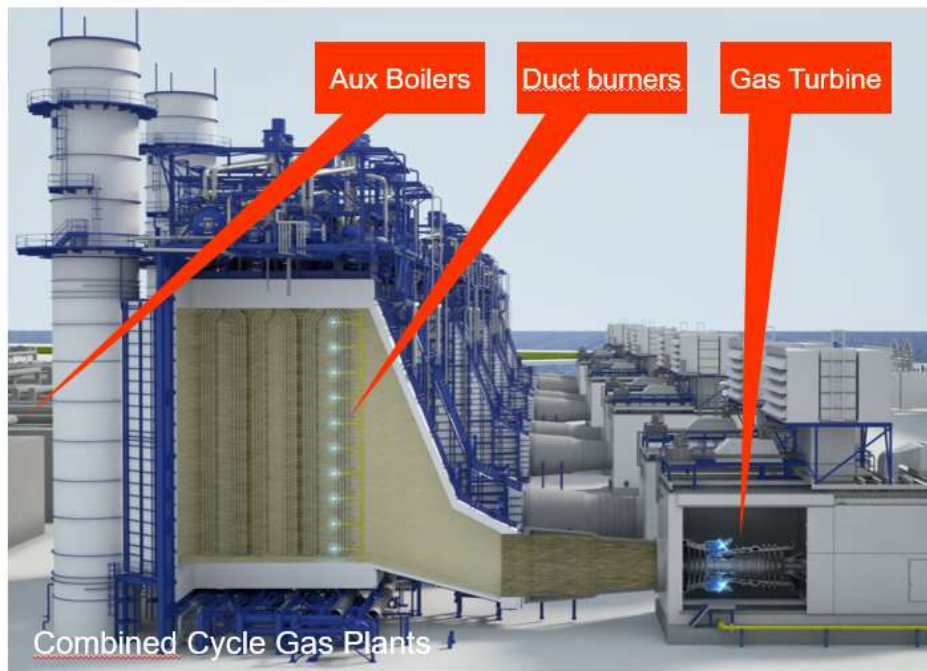
### 03 Application Example – Real Installation

- Pipe size DN700
- UFM Size DN500
- Pls note, the permissible service error limits are usually twice the calibration error limits.



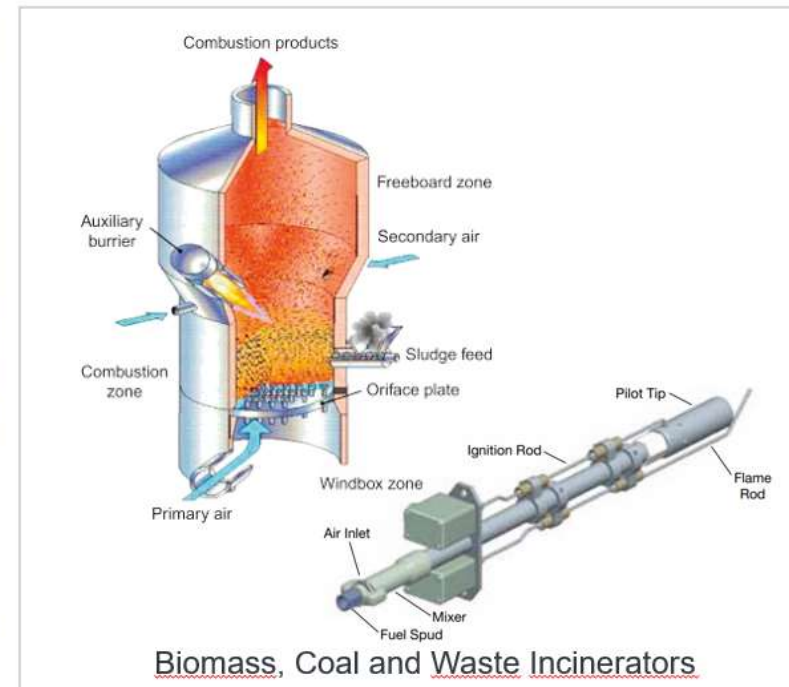
## MID in Power Generation

### 04 Where is fuel gas used?



29

| GID Power Quarterly Update | Stefan Kranz



## Application

### 05 Fuel Gas Skid

#### Application Background

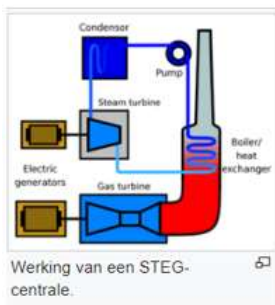
The 150 MWe1 combined cycle gas turbine power plant CCGT is part of an integrated solar combined cycle plant ISCC. IT is operated near Hassi R'Mel in Algeria. The fuel gas for the supply of the plant needs to be conditioned, pressure regulated and measured.

#### Requirements

Accurate, reliable and maintenance-free solution according to MI-002 for natural gas

#### Solution

Complete fuel gas system with fuel gas conditioning, pressure reduction, measurement of flow and quality, safety functions



# Energy Transition

## 06 Project Example Data Center

### Project Background

- Newbuild of a R&D Campus of SAP at TUM
- Sustainable site according to LEED standards
- Cooling of datacenter
- Use of heat pump technology, waste heat and geothermal heat

### Task

- Accurate measurement of the energy flows heat & cold for control purpose
- Custody transfer of energy flows between contract parties MI-004

### Products Applied

- Ultrasonic flowmeters including heat calculators and paired RTDs

### Customer Benefits

- Accurate energy measurements according to MI-004 class 1
- Complete one-stop shopping supply



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## KROHNE our focus

### Code of conduct

- . global sustainability assessment KROHNE Group environmental impacts.
- . health & safety achievements and social & ethical practices for our clients and stakeholders.
- . reduction in raw material and energy consumption cost savings and CO2 footprint.
- . solutions for our customers that ensure sustainability targets are achieved.



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## MID in Power Generation Summary



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## MID in Power Generation Q & As



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## MID related applications in the Power Generation Industries

Dank voor uw aandacht



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