GHG reduction and the EU-ETS – learnings, impact and achievements from BASF perspective

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BASF – We create chemistry

- Our chemistry is used in almost all industries
- We combine economic success, social responsibility and environmental protection
- Sales 2016: €57,550 million
- EBIT 2016: €6,275 million
- Employees (as of December 31, 2016): 113,830
- 6 Verbund sites and 352 other production sites

Chemicals – a growth industry

Global annual growth rate of ~3.6%*


Agriculture

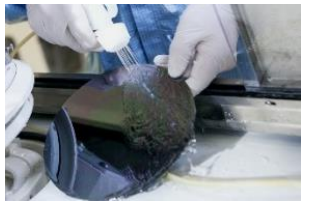

Health & nutrition


Energy & resources


Construction & housing


Consumer goods


Transportation


Electrical & electronics

Chemistry as enabler to meet current and future needs


~10bn … people by 2050


70% … of the world population will live in cities by 2050


50% … more primary energy consumption by 2050


30% … more food needed by 2050

* Average annual real change 2017-2019; BASF Report 2016 p.121

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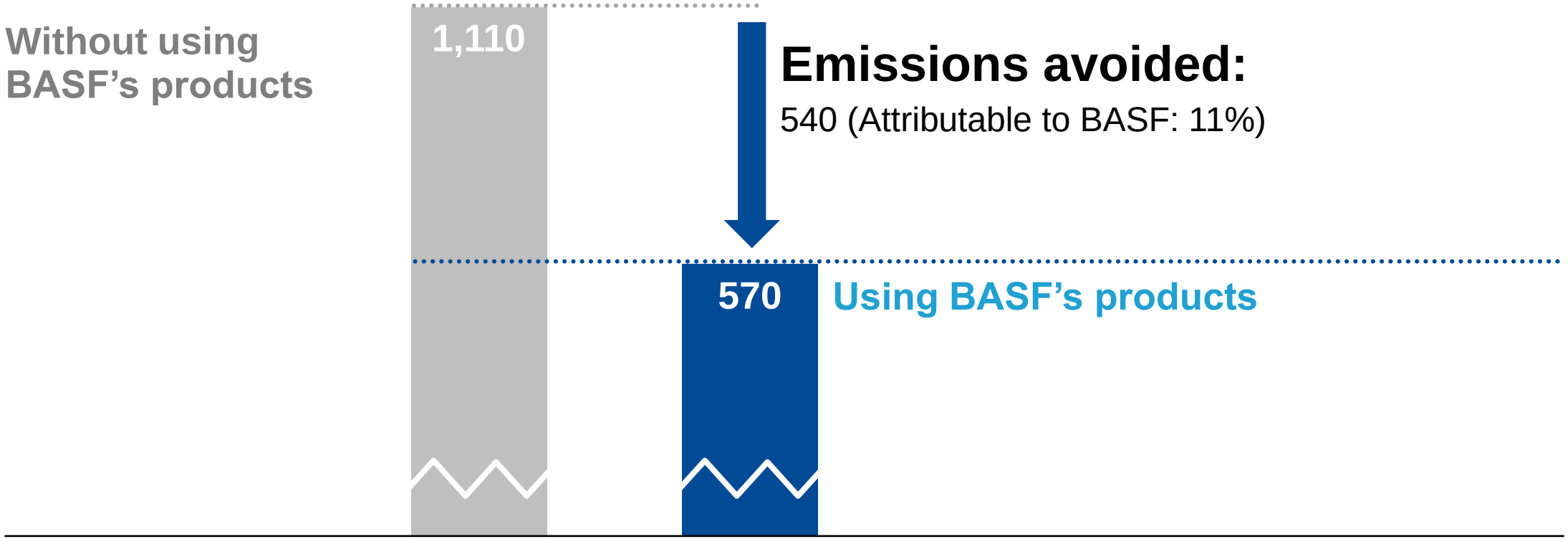
We help our customers to reduce their CO_2 emissions

Prevention of greenhouse gas emissions through the use of BASF products 2016 (in million metric tons of CO_2 equivalents)



* CO_2 equivalents = units for measuring the impact of greenhouse gas emissions on the greenhouse effect

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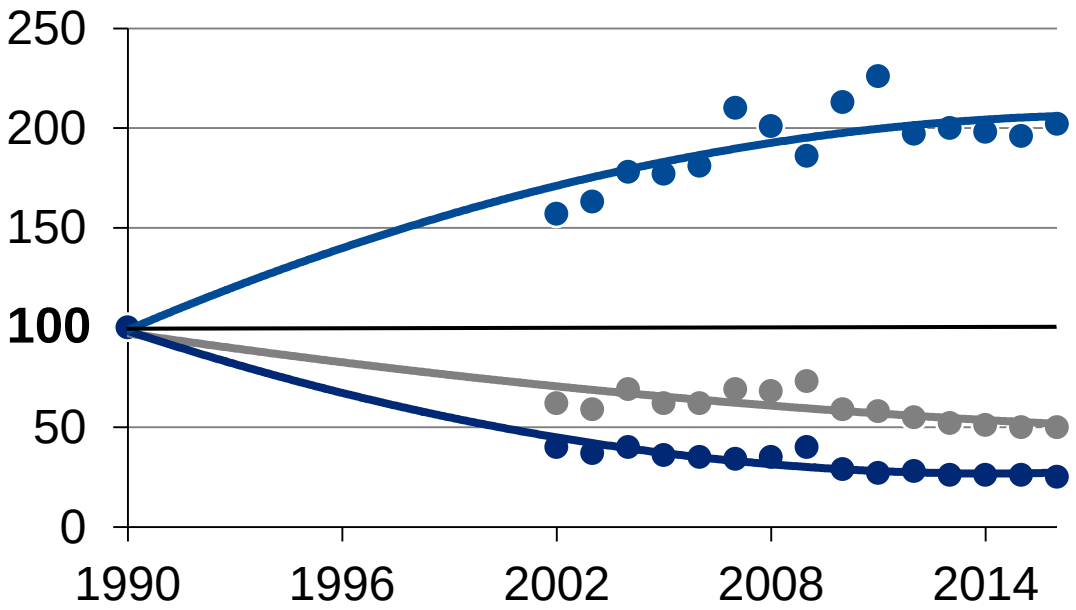
Reduction of greenhouse gas emissions with increased production

Development since 1990

Index 1990 = 100%, BASF Group excl. oil and gas business



+102% volume of sales product

–50.2% absolute greenhouse gas emissions

–75.4% specific greenhouse gas emissions

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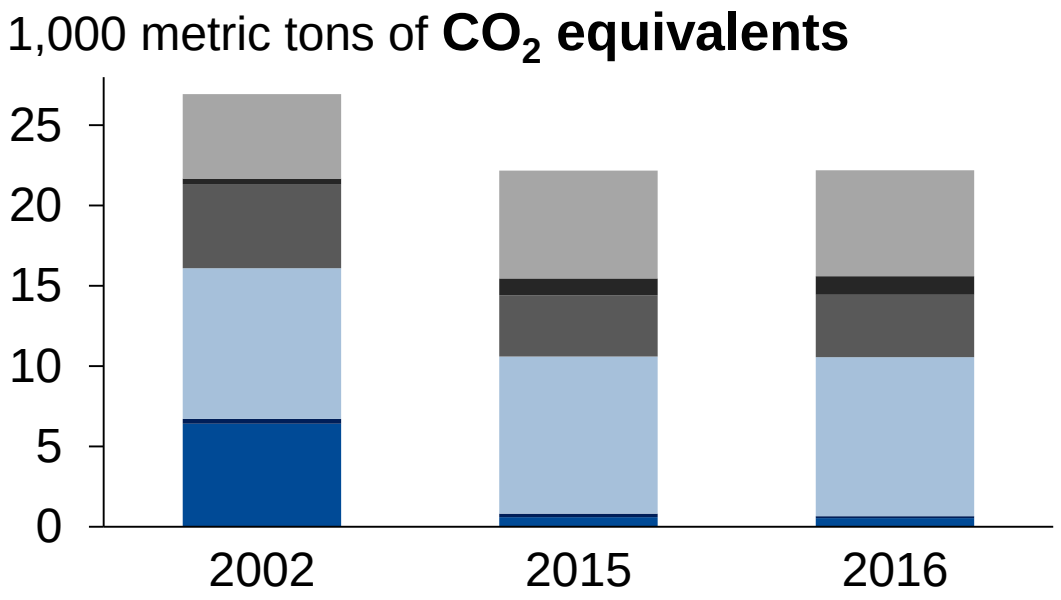
Greenhouse gas emissions of BASF Group

- Successful reduction of N2O emissions
- Around 50% of BASF Group emissions in 2016 resulted from steam and electricity generation in our power plants as well as in our energy suppliers' power plants



Energy-specific emissions

- CO_2 from centralized energy production (Scope 1)
- CO_2 from centralized energy production for third parties (Scope 1)
- CO_2 from purchased energy (Scope 2, location-based)

Process-specific emissions

- CO_2 from individual plants: decentralized energy production, waste incineration, process emissions (Scope 1)
- CH_4, HFC, PFC, SF_6 from individual plants (Scope 1)
- N_2O from individual plants (Scope 1)

Impact of the EU ETS in 3rd & 4th trading period

About **100 BASF installations** are subject to the ETS

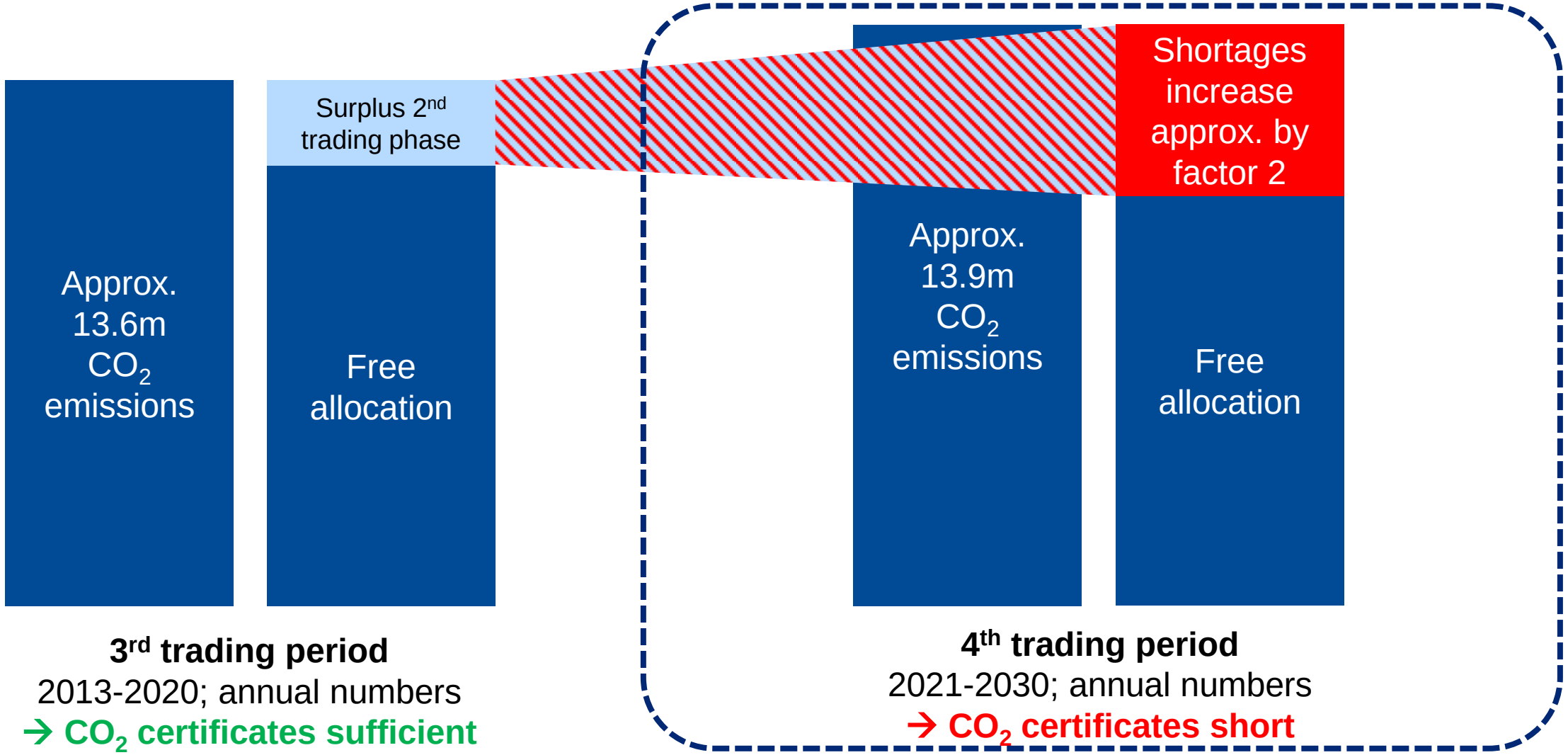
For **chemical process emissions**, CO_2 certificates allocated free-of-charge are based on benchmarks. We expect allocation for our chemical processes to be nearly sufficient in the 3rd trading period.

New 100% **auctioning of all certificates** (also industrial, such as our own BASF) for electricity generation and the Cross Sectoral Correction Factor (CSCF)
→ we expect the annual undersupply to distinctly increase in the 4th trading period

The extent to which this negatively affects the **global competitiveness** of our European sites depends on the trading price of these CO_2 certificates

➔ Undersupply of free certificates is leading to higher costs for chemical production and power generation/supply. None of our major competitors outside Europe have these costs.

BASF Outlook for 4th trading period



3rd trading period
2013-2020; annual numbers
→ **CO_2 certificates sufficient**

4th trading period
2021-2030; annual numbers
→ **CO_2 certificates short**

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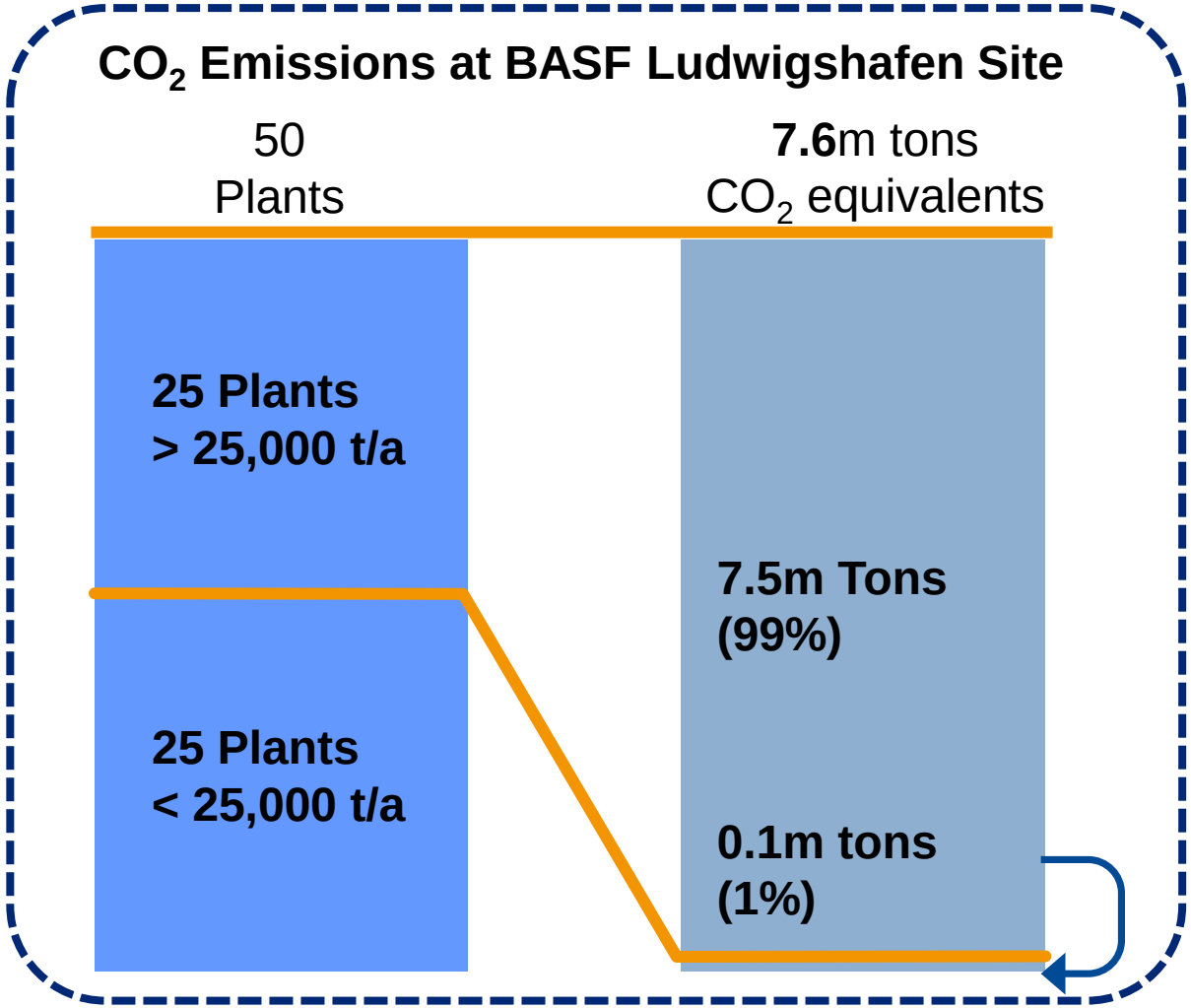
Questions of Proportionality



Bureaucracy

- Many installations are small emitters

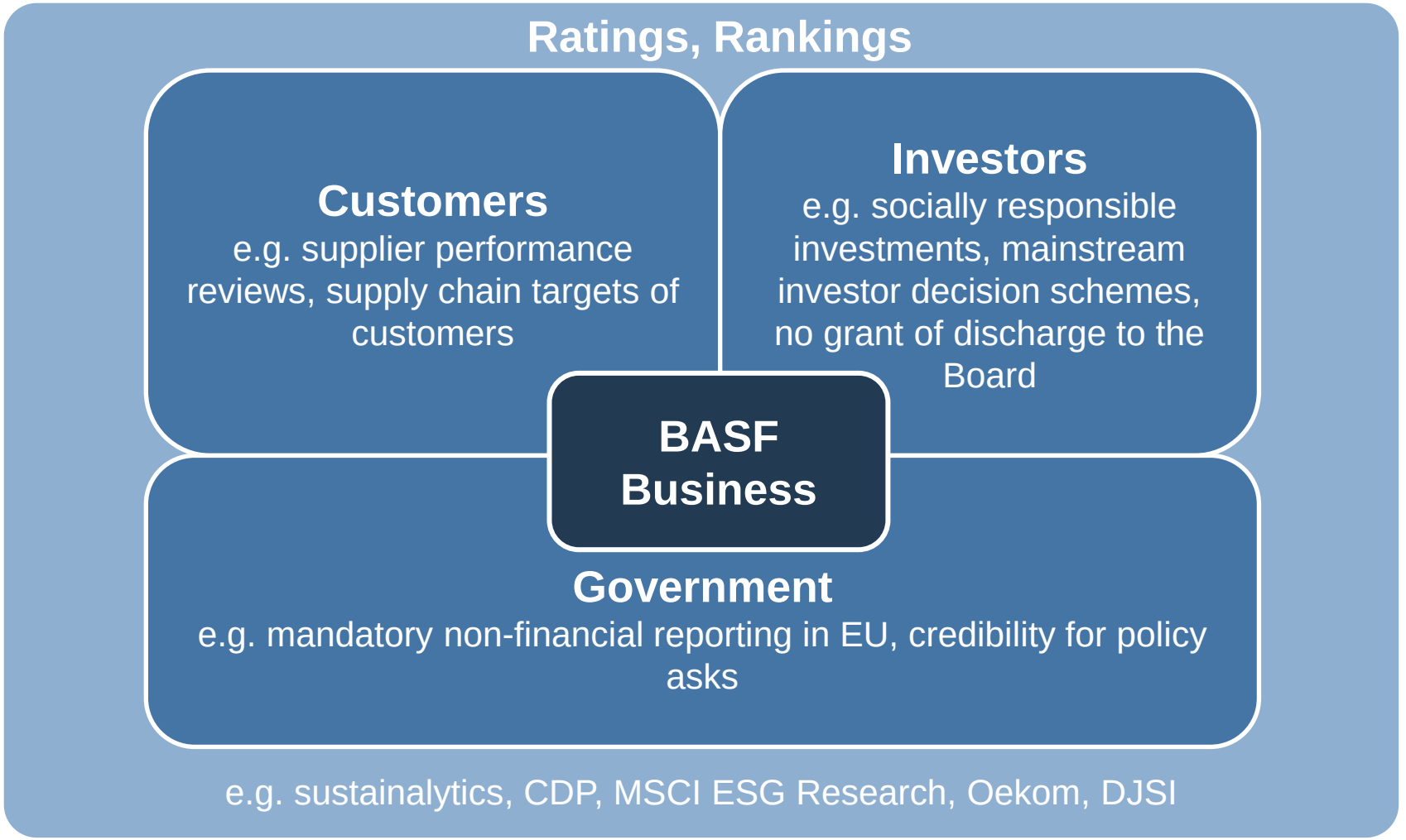
➔ much bureaucracy

➔ few emissions

- effect for climate protection?

50 percent of the plants are small emitters with less than 25,000 tons of CO_2 equivalents per year. They only account for approximately 1 percent of the total emission volume.

Stakeholder Management at BASF



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Organization of the BASF Group

- Combined into five **segments**,13 **divisions** bear operational responsibility and manage our 57 global and regional **business units**
- The operating divisions develop strategies for the 86 different **strategic business units**
- The **regional divisions** contribute to the local development of BASF's business, help to exploit market potential and are responsible for optimizing the infrastructure for our business
- New organization 2017: five **research units**, eight **functional units** and seven **corporate units**.

Energy and climate protection

Greenhouse gas emissions

per metric ton of sales product
by 2020 (baseline 2002)*

-40%

Status 2016:
-37.2 %

Energy efficiency

Coverage of our primary energy demand through certified energy management systems (ISO 50001) at all relevant sites

90%

Status 2016:
42.3 %

* Excluding oil and gas production

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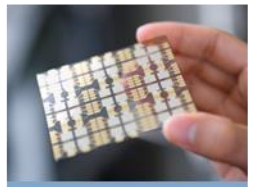
BASF's contribution towards society
1/3 R&D budget for "Energy & Climate" solutions

	Resources, Environment & Climate	Food & Nutrition	Quality of life

Chemistry as enabler

Customer industries	Transportation	Construction	Consumer Goods	Health & Nutrition	Electronics	Agriculture	Energy & Resources
							
Growth fields	Batteries	Heat management	Enzymes	Medical	Organic Electronics	Plant biotechnology	Energy management
	Leightweight composites					Functional crop care	Rare earth metals recycling
	Heat management						Wind energy
							Water solutions

Innovation is key

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Emissions prevented through the use of climate protection products – examples

	Insulation materials	N_2O decomposition catalysts	Masterflow
			
Customer solution to reduce emissions	Installation of insulation material	Catalyst filling	Wind turbines
Total emissions prevented through the use of solution*	80.1 million tons CO_2e	30.6 million tons CO_2e	158.0 million tons CO_2e
BASF's estimated share of the cost of the solution	10 − 50%	> 90%	0.1 − 1.0%
Emission reductions assigned to BASF based on share of costs	12.9 million tons CO_2e	29.9 million tons CO_2e	0.24 million tons CO_2e

Special Rules for Small Emitters

Small Emitters:

- Can-rule for member states, who implement equivalent reduction measures (e.g. CO2-tax)
  → **no use in GER**
- Combustion activities: emissions < 25.000 t CO2-equivalent
  and thermal rating < 35 MW
- Other activities: emissions < 25.000 t CO2-equivalent

Simplified Monitoring Methods:

- Less mandatory documents
- Lower accuracy levels
- Use of supplier invoices
- BUT: obligation for verified emission reports and related audits

ETS 2030

ETS design should be

- enabling industry to meet emission reduction goals in a most cost-effective manner
- consistent with efficient growth and competitiveness
- globally compatible: Minimize distortions between sectors or installations inside and outside the ETS Scheme (EU, China,…)

Only a global CO2-price of > 100 €/t CO2 would allow for big steps in decarbonization which are not cost-competitive today, e.g.:

- Increased use of biomass
- Hydrogen-based chemistry with renewable energy
- CCS