



Chemical Industry and Climate Challenge – Covestro and SPIRE

Matthias Böhm

Head of Energy Excellence
COVESTRO Deutschland AG

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www.aee-intec-events.org

Renewable Heating and Cooling in Integrated
Urban and Industrial Energy Systems

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covestro.com





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Covestro – leading in the world of polymers



- €14 bn in sales
- 16,200 employees¹
- Listed on the DAX stock exchange



Large portfolio

- Products and solutions for many industries



Global player

- 30 sites worldwide
- Close to markets, customers and suppliers



Highly innovative

- 1,000 employees in research and development
- 80 years of ideas and inventions



To make the world a brighter place



Our vision for a brighter world

In a brighter world the United Nation's 17 Sustainable Development Goals are realized



How we want to make the world a brighter place

With innovative products and solutions for more sustainability we push the boundaries of what is possible

Enabling solutions for global challenges

Pushing boundaries

Huge global challenges set limits to our current way of life.

Covestro goes the extra mile to master these challenges and to push the boundaries of what is possible.

This is how we achieve innovative solutions – efficiently, economically and sustainably.

At the same time we develop and improve innovative production technologies that reduce our direct impact on the environment.

Climate change



Solutions for economical cars, energy-efficient houses and renewable energies

Population growth



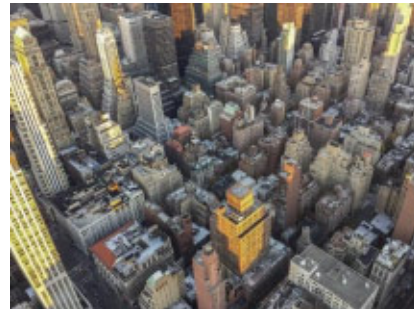
Solutions for a reliable food supply and to create affordable housing

Mobility



Solutions for sustainable mobility – to make vehicles lighter, safer and more comfortable

Urbanization



Solutions for the energy-efficient and aesthetic design of buildings in areas of high population density

Demographic change



Solutions for more hygienic and resource-saving medical care

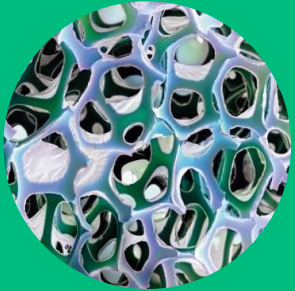
Digital revolution



Solutions to improve the efficiency, design, safety and usability of electronic devices

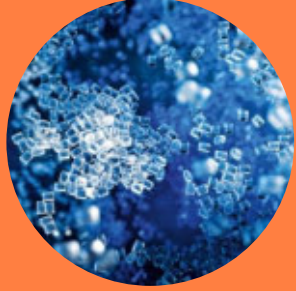
Our portfolio and the served key industries

Polyurethanes



Raw materials for rigid and flexible foams

Polycarbonates



Granules and sheets for a wide variety of applications

Coatings, Adhesives & Specialities

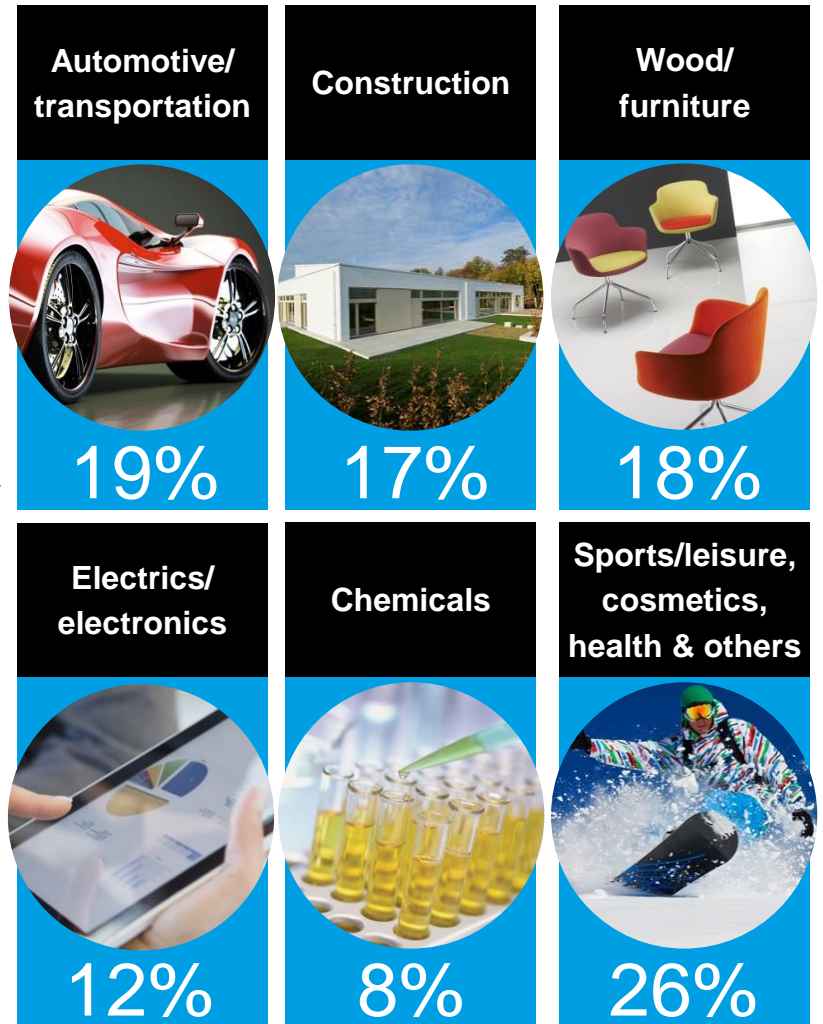
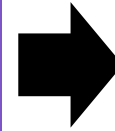


Raw materials for coatings, adhesives and specialities

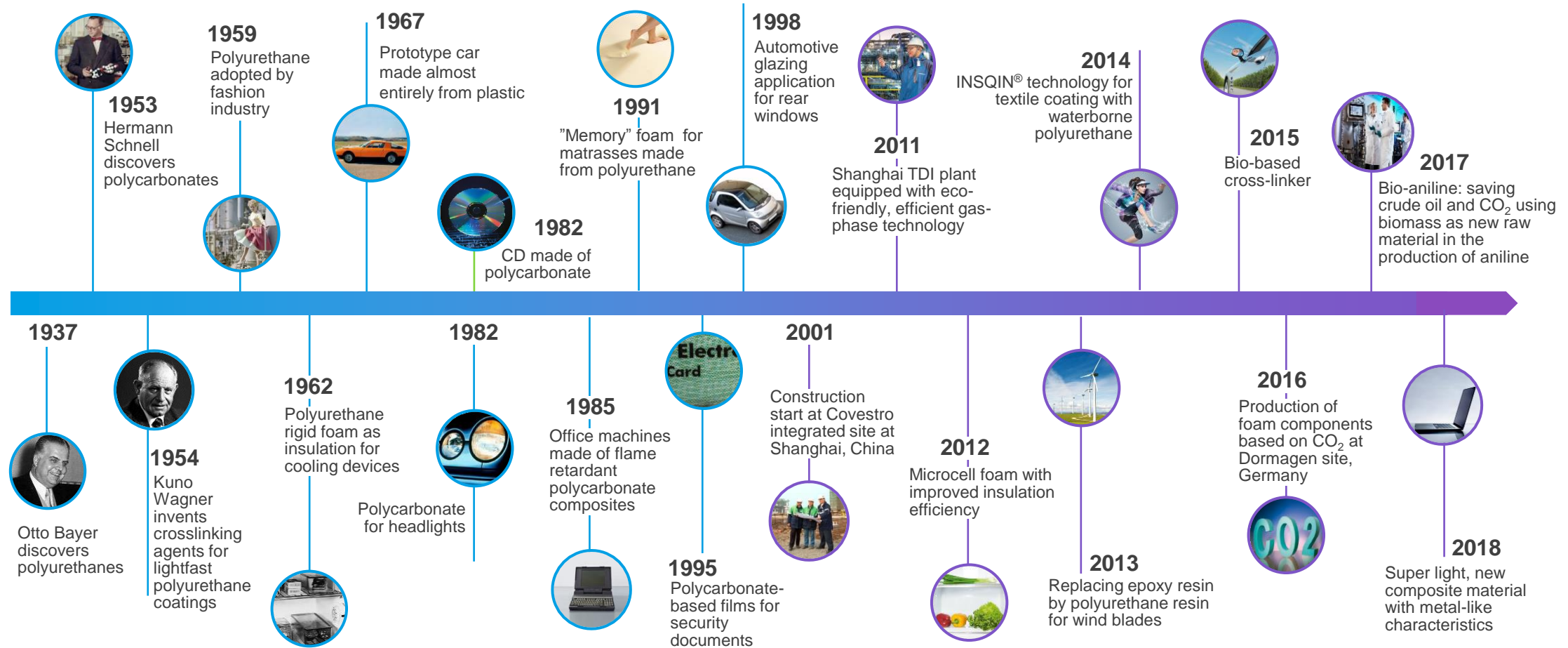
Basic Chemicals



Important backbone for polymer production



Covestro – innovative by tradition



A holistic approach for sustainability

Five goals for 2025



Align research and development with the UN sustainability goals



Apply own dedicated sustainability standards to all suppliers



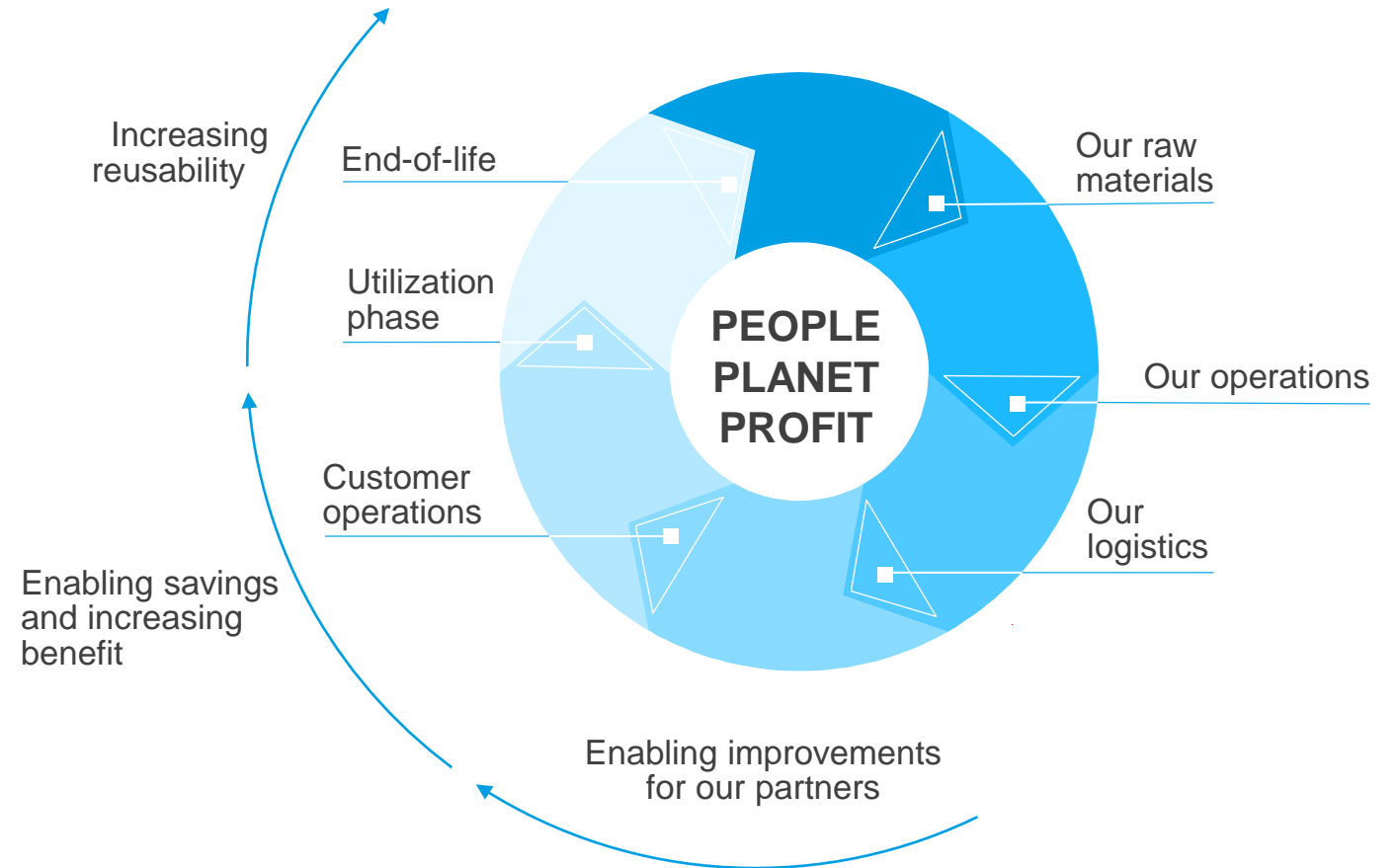
Reduce own specific greenhouse gas emissions by 50%



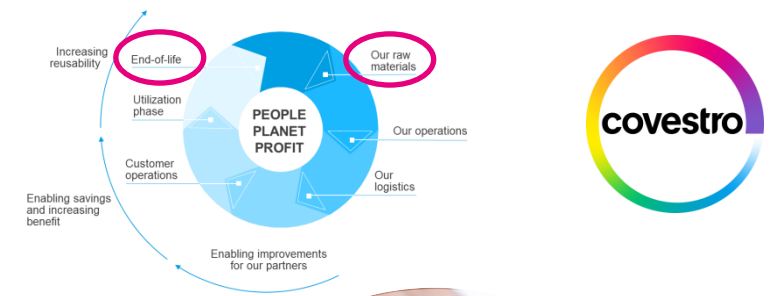
Improve living conditions of 10 million people in underserved markets



Use carbon in the most intelligent way



Example 1 – alternative raw materials



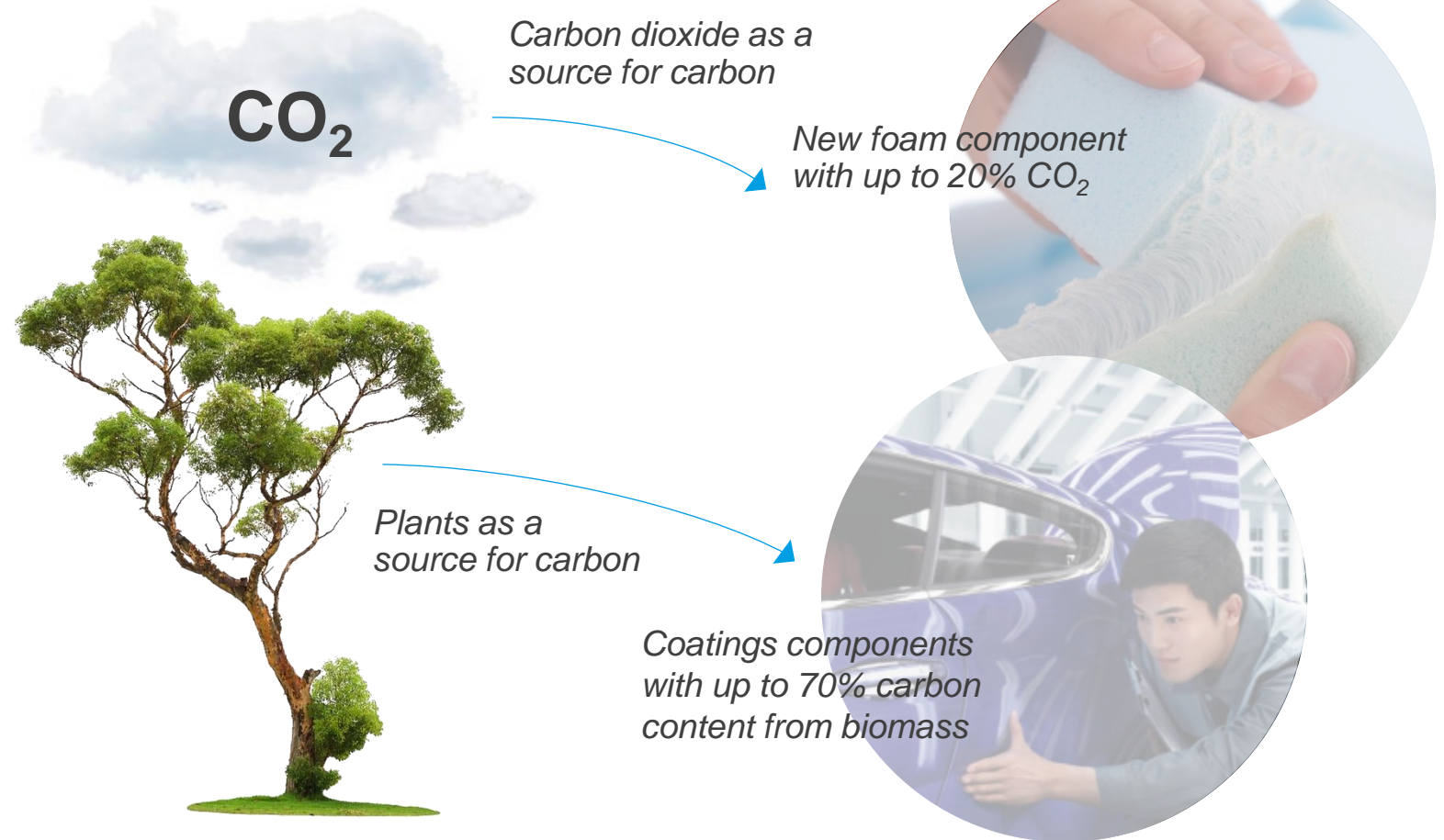
Replacing crude oil

Covestro focuses on new raw materials like CO₂ and plants as alternatives for scarce fossil resources such as crude oil.

We already use CO₂ to produce foam components – further applications are in progress.

In addition, we offer paint hardeners for cars and furniture whose carbon content is derived from plants.

We are now also able to extract the important basic chemical aniline from biomass instead of crude oil.



Example 2 – eco-friendly production



Energy-efficient production

Environmental protection and efficient use of resources are guiding our production.

We develop and use energy-saving technologies which support a more efficient and sustainable production – for example of chlorine, isocyanates and polycarbonates.

We have also implemented an intelligent control system in around 60 of our production facilities to optimize the use of energy.

Energy management system: *STRUCTese™*



Gas-phase technology for the production of isocyanates



Oxygen depolarized cathode technology for chlorine production



Efficient melt process for polycarbonate production



Achievements in Energy Efficiency

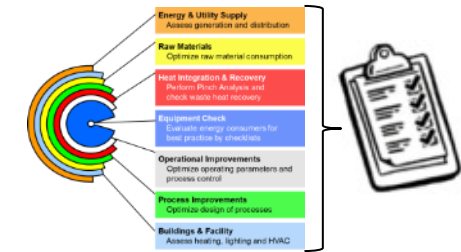
STRUCTese™ - A three step approach for energy management



1

Energy Efficiency Check

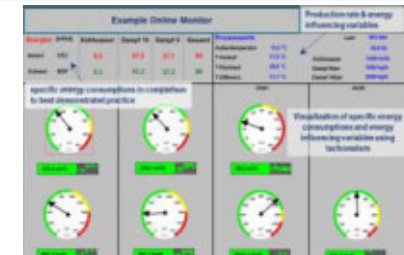
- Detailed process analysis, energy review
- Identifies efficiency projects, categorization, action plans



2

Online Energy Monitoring

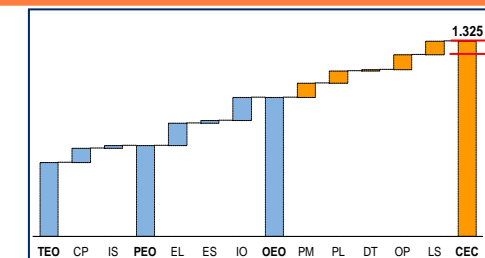
- Compares current energy consumption with „best demonstrated practice“ (BDP)
- Creates „control room awareness“



3

Energy Loss Cascade

- Calculation and Reporting of EnPIs (Energy Performance Indicators)
- Transparent visualization of energy losses, incl. target setting and monitoring

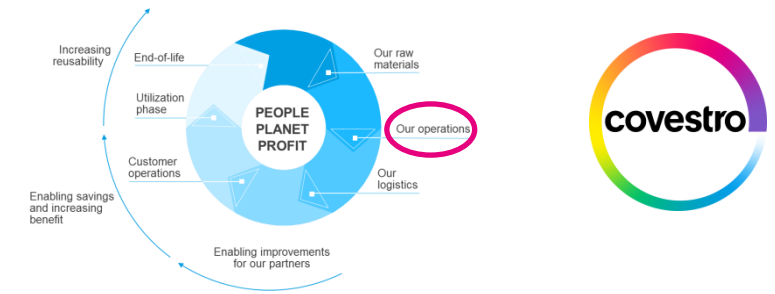


For sustainable energy efficiency development



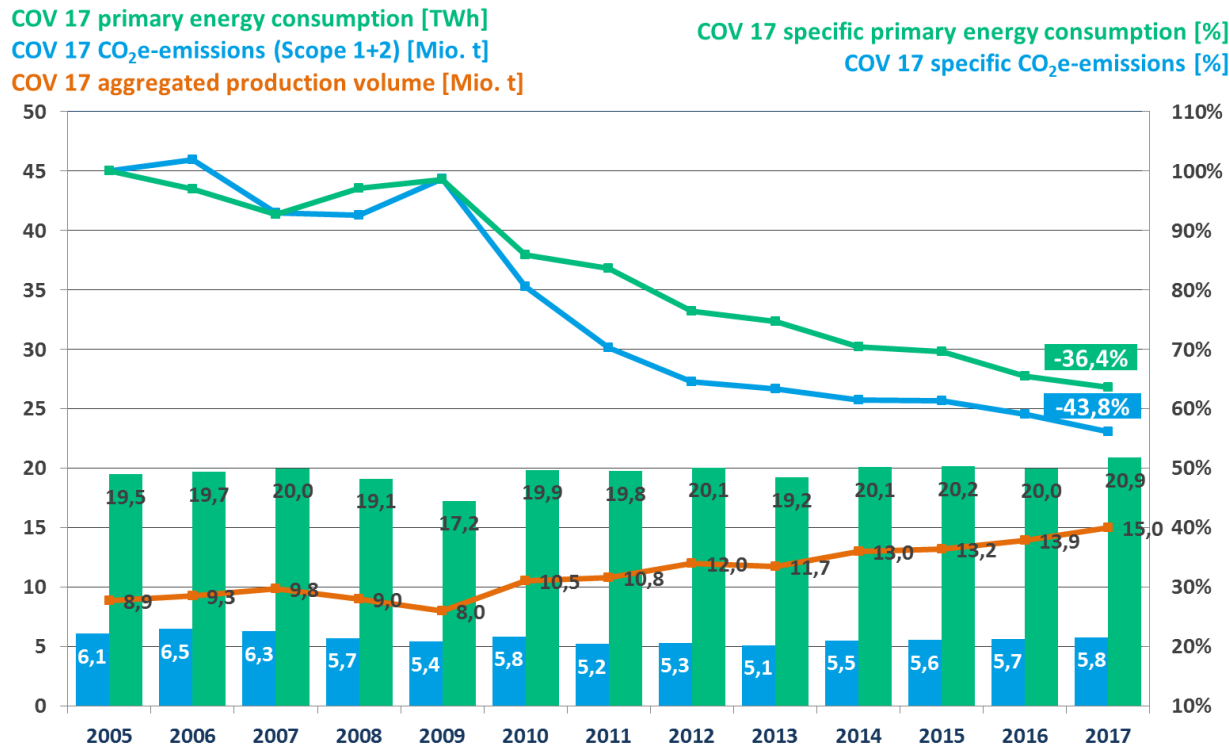
Achievements in Energy Efficiency

Successful reduction of our impact on the environment



Specific Primary Energy Consumption & CO₂e-Emissions

- based on the aggregated production volume within specification -



- 36,4% reduction of specific primary energy consumption since 2005 (2030 target: -50%)
- 43,8% reduction of specific greenhouse gas emissions since 2005 (2025 target: -50%)
- Sustainable yearly savings achieved:
 - 600.000 t CO₂e¹/a
 - 1,83 Mio. MWh PE²/a

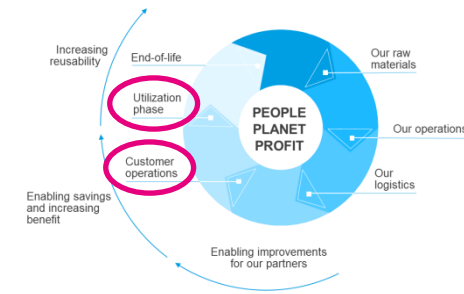
➔ **Over ten years growth in production³ without increasing energy consumption and GHG emissions!**

1 CO₂e = Carbon dioxide equivalents acc. to Kyoto Protocol

2 PE = Primary energy equivalents acc. to standardized COV factors

3 Without changes in product portfolio

Example 3 – leverage alternative energies



Reinvent the wheel

The future belongs to renewable energies. In theory, wind power alone could already satisfy the world's hunger for energy.

In order to leverage its potential even further, this clean form of electricity generation must convince not only ecologically, but also economically.

Covestro paves the way – with innovative materials for rotors, towers and pipes.

Our focus is also on China, the global leader in wind energy.



We enable a more efficient production of longer rotor blades for wind turbines

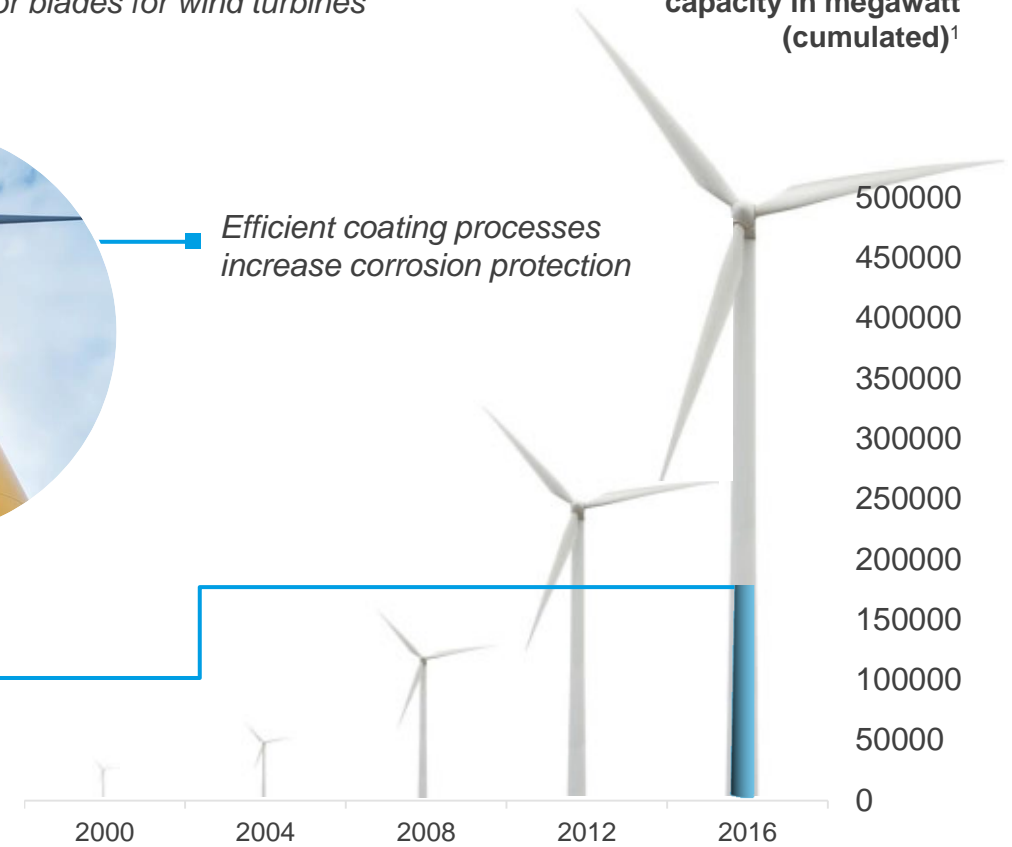


Efficient coating processes increase corrosion protection

Currently, China accounts for about 35% of the global wind energy production capacity¹



Globally installed wind power capacity in megawatt (cumulated)¹



Global network



Stronger together

Our curiosity drives us to pioneering innovations that challenge the status quo.

In keeping with the principle of open innovation we also work with spin-offs and start-ups from the academic area.

In this way we can quickly turn promising ideas into successful products.

Cross-industry projects
(e.g. Carbon4PUR)



Honoring outstanding research
(e.g. "Covestro Science Award")



Cooperation in design (e.g. through the Covestro designer network or the idea.lab)



Joint projects with universities
(e.g. "Covestro-Tongji Innovation Academy")

SPIRE

Sustainable Process Industry through
Resource and Energy Efficiency



SPIRE cPPP

Towards the Next Generation of EU Process Industry

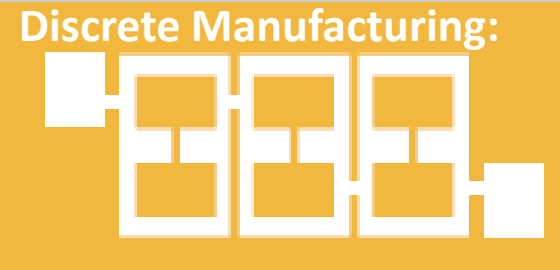
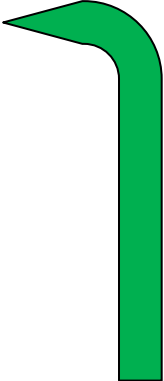
Matthias Böhm
Covestro Deutschland AG
A.SPIRE

The value chain



Strengths

- 6.3 million direct jobs
- 19 million indirect jobs
- 450,000 enterprises
- €1,8 trillion/y turnover
- 4.7% OF EU28 GDP



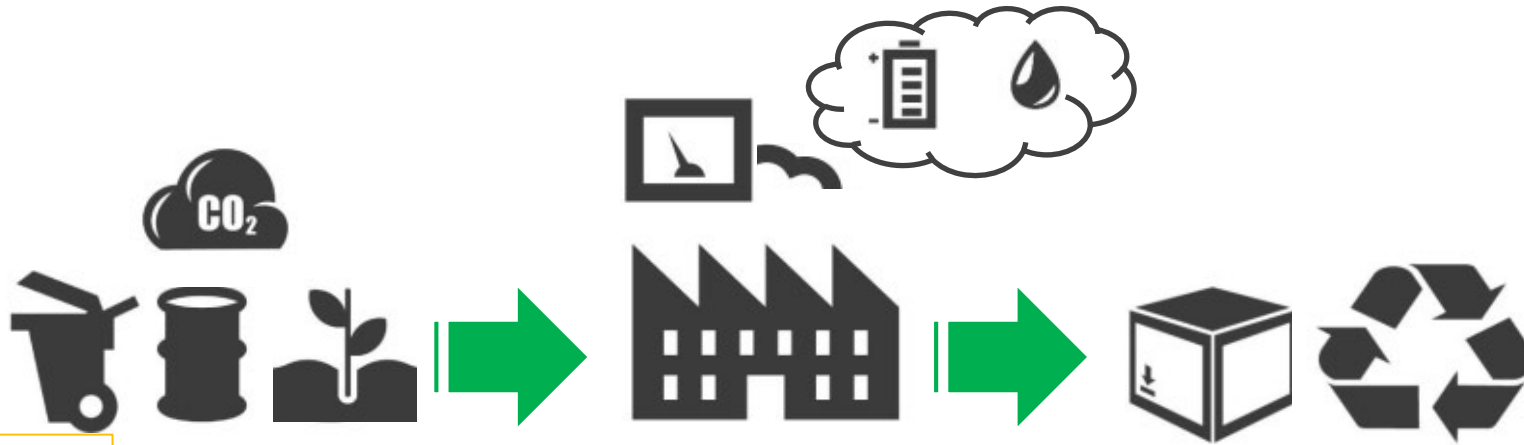
Challenges

- Resources & energy
- Competitiveness
- High-risks/long-term investments



SPIRE 2030 roadmap

TO TOMORROW'S SCENARIO:



FEED

- (Re)invent feedstock (waste, bio, CO₂)

PROCESS

- Reduce emissions; (re)invent energy & resource concepts, incl. industrial symbiosis
- Introduce digital devices for better monitoring and control

APPLICATIONS

- (Re)invent materials for optimised processes
- (Re)invent processes & materials with a significantly increased impact on resource & energy efficiency down the value chain: transport, housing

WASTE-2-RESOURCES

- Reduce waste & (re)invent technologies for valorisation of waste streams within and across sectors

SPIRE EXPECTED IMPACTS

R+I to integrate and demonstrate at least **40 innovative systems and technologies:**

- 7 in Adaptable processes able to use different feedstocks
- 6 in Reduction and re-use of waste with ambition to close the loop
- 9 in Innovative processes leading to CO₂ reduction
- 8 in Green technologies to develop novel materials for new and existing markets
- 6 in Industrial processes reducing water use
- 4 using Technology uptake within/between sectors to enable industrial symbiosis

... and capable of achieving across process industry (by 2030):

- **Up to 30% less fossil energy intensity**
- **Up to 20% reduction in non-renewable, primary raw material intensity**
- **Up to 40% less CO₂-equivalent footprints**
- **10 new types of high-skilled jobs**



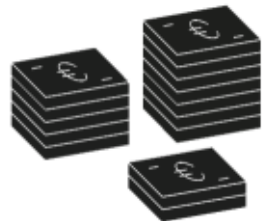
Carbon Capture & Utilisation



Turning industrial waste gases (mixed CO/CO2 streams) into intermediates for polyurethane plastics for rigid foams/building insulation and coatings

- **Call:** H2020-SPIRE-2017
 - **Topic:** SPIRE-08-2017: Carbon dioxide utilisation to produce added value chemicals
- **Start/end date:** From 01.10.2017 to 30.09.2020

MISSION	EXPECTED IMPACT
<p>Generate value from the entire carbon from the flue gas stream and thus making carbon productive and the resulting PUR products more sustainable.</p>	<ul style="list-style-type: none"> • Reduction of the CO2 footprint of polyurethane production by 20-60% • Substitution of at least 15% of the oil-based reactants by waste-gas based carbon. • Green House Gas emissions reduction – 60% CO2 eq. • Saving 70% of process energy compared to conventional chemical processes



Project type: **RIA**
 Coordinator: **Covestro**
 Total investment: **€7.8M**

AMMR	CEA	COV	DECHEMA	ICL
MEGARA	MFPA	PNO	Recticel	RWTH
SPG	TUB	UGent	UL	

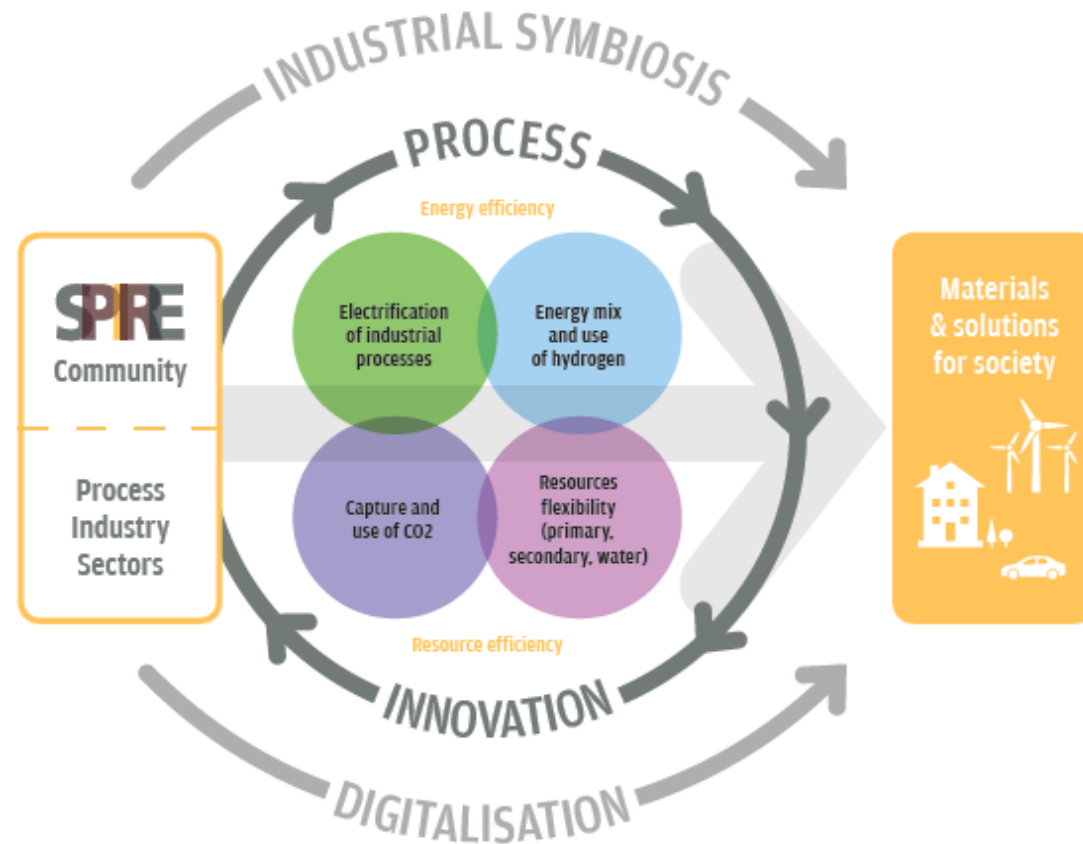


4 technological drivers

Electrification
Energy mix and H₂
Capture and Use of CO/CO₂
Resources flexibility

2 transversal topics

Digitalisation
Industrial symbiosis



SPRE VISION 2050

An integrated and digital European process industry
fostering a well below 2 degrees planet
and a fully circular economy



Thank you for your attention!

Matthias Böhm

Head of Energy Excellence
Covestro Deutschland AG
matthias.boehm@covestro.com

To make the world a brighter place