



We create chemistry

Sustainable advanced materials & systems

Dr Geoff Mackey

Internal

BASF – We create chemistry

- Our chemistry is used in almost all industries.
- We combine economic success, social responsibility and environmental protection.
- Sales 2021: €78.6 billion
- EBIT before special items 2021: €7.8 billion
- Employees (as of December 31, 2021): 111,047
- 6 Verbund sites and 232 other production sites
- Around 90,000 customers from various sectors in almost every country in the world

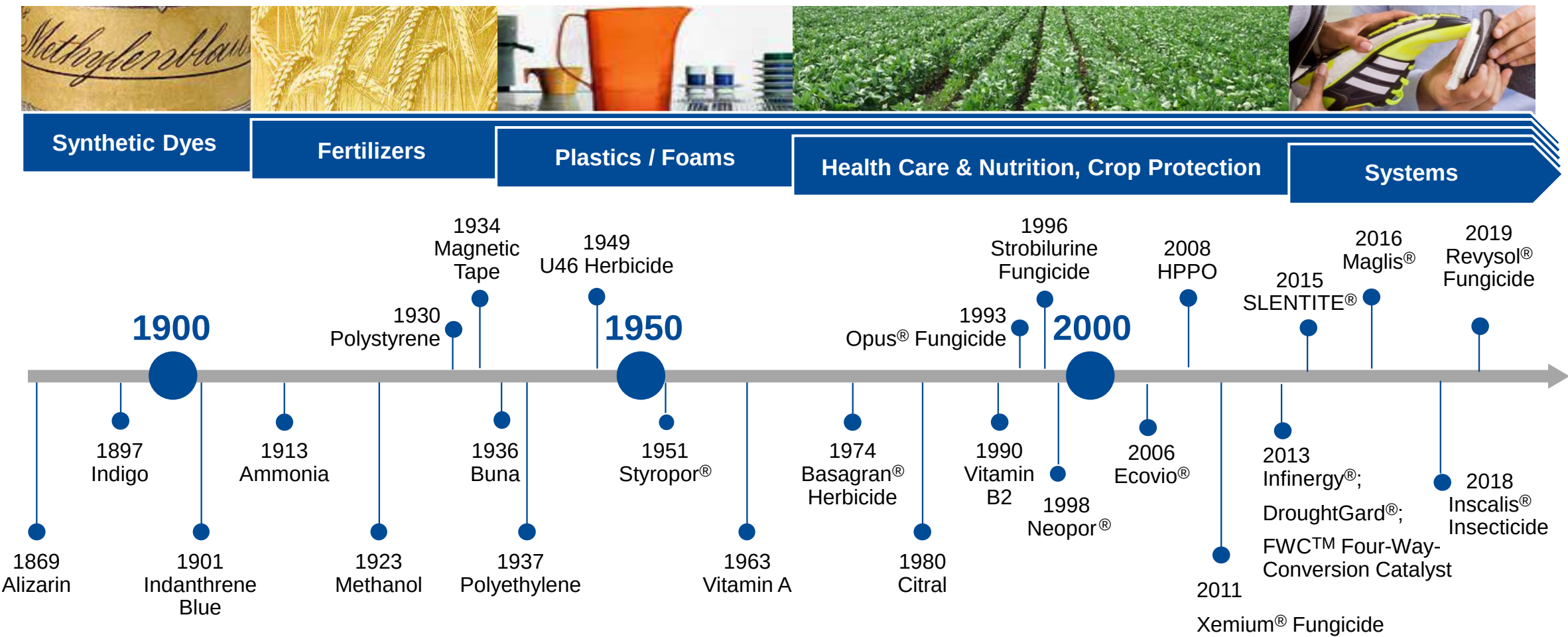




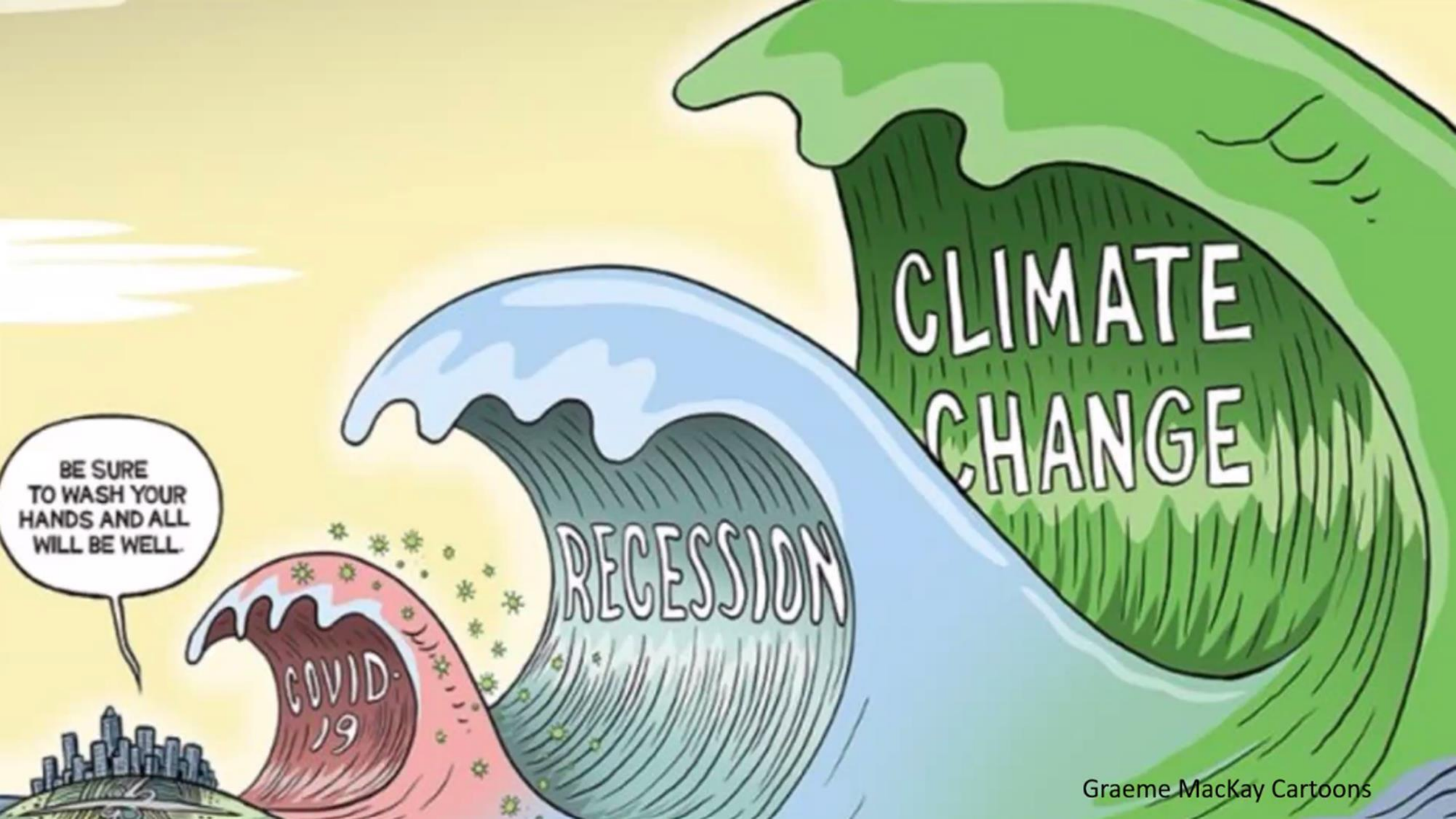
Our purpose:

We create
chemistry for a
sustainable future

Continuous Commitment to Research & Development



We create chemistry for a sustainable future – more than 150 years of innovation @ BASF



BASF Corporate Commitments

Our Corporate Commitments cover every part of our value chain and operations to deliver long-term business success.

Suppliers

BASF operations

Customers

And along the way...

**We
source
responsibly**



**We produce
safely for
people and
the
environment**



**We
produce
efficiently**

**We drive
sustainable
solutions**



**We value
people and
treat them
with respect**



Innovation – new processes, technologies and products for a sustainable future

Resource-efficient solutions and business models to decouple growth from the consumption of finite resources



Our success factors:

Customer focus,
digitalization,
creativity,
efficiency and
collaboration
with
external partners

Global expenditures for research and development over **€ 2 billion**, world leader in chemical industry

Approximately **10,000** employees world-wide involved in research and development

Around **950** new patents filed in 2020

Global Know-how Verbund with external partners

Sustainable chemistry is hard-wired in our strategy

We create a sustainable future with our innovations

Driving the
sustainability
transformation



Decouple our CO₂ emissions from organic growth through our Carbon Management program

Invest cutting-edge technologies to speed up the transition to a circular economy, such as our ChemCycling project

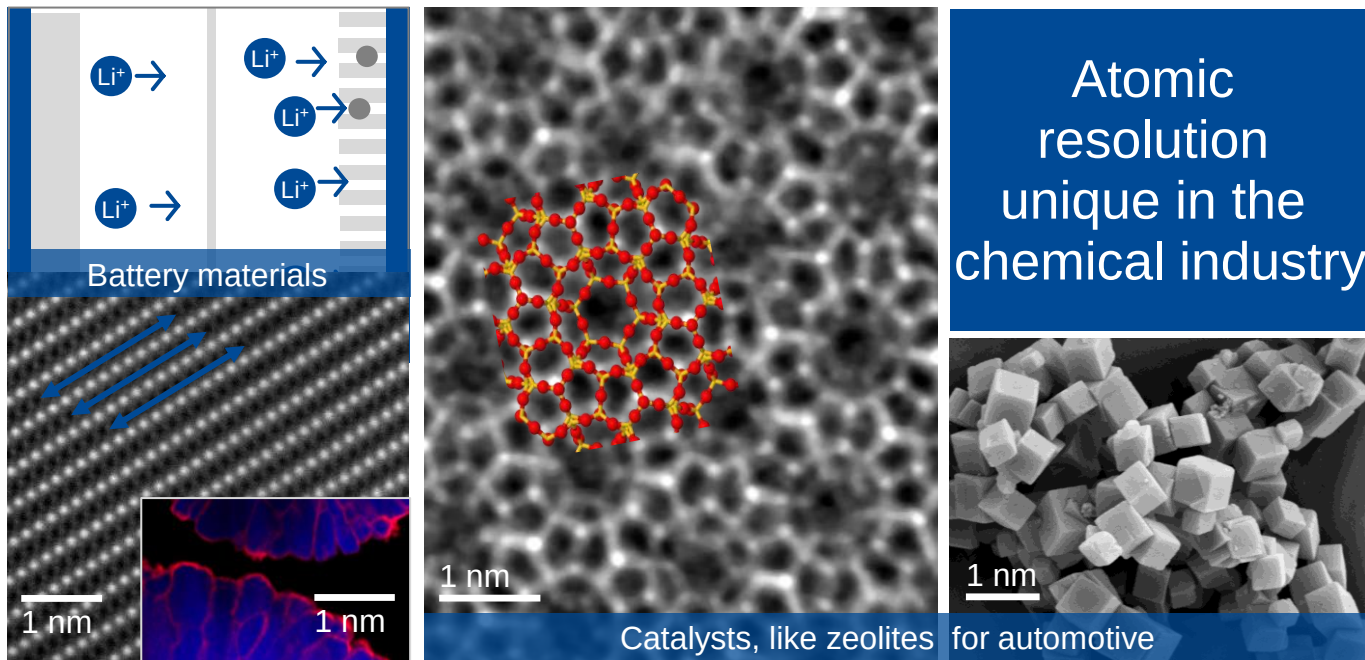
By calculating the CO₂ footprint, we create transparency for our customers regarding the specific emissions for each BASF product

Leverage our innovation power to achieve €22 billion in Accelerator sales in 2025. To achieve this goal, we will integrate Sustainable Solution Steering in the R&D pipeline

By the year 2030, BASF aims to double its sales generated with solutions for the circular economy to €17 billion

Moving the boundaries in materials' development

Innovative electron microscopy enables materials' design on atomic level, accelerates product development and safeguards BASFs IP position



Challenge:

Product properties are rooted in atomic structures. To optimize, we need to push the envelope, for example in catalyst or battery material's development.

Research:

Redefining the limits of electron microscopy for unprecedented insights, including investigation of sensitive materials such as porous materials (like metal-organic frameworks, zeolites) or polymers.

Result:

Strengthening BASFs business portfolio and product pipeline including IP position with in-house access to unparalleled imaging and measurement capabilities.

Climate Protection Goal

We aim to achieve net zero CO₂ emissions¹ by 2050.

We want to reduce our absolute CO₂ emissions¹ by 25 percent by 2030 compared with 2018.

¹ The goal includes Scope 1 and Scope 2 emissions without emissions from sale of energy to third parties. Other greenhouse gases are converted into CO₂ equivalents according to the Greenhouse Gas Protocol.

Our way to net zero 2050

- We are a **key enabler** in the net zero transformation of base chemicals and downstream value chains
- Globally, we want to reduce our absolute CO₂ emissions **by 25% by 2030 compared with 2018**
- We aim to achieve **net zero CO₂ emissions at BASF by 2050**
- We are a **front-runner** in offering customers a portfolio of **products with lower carbon footprints** to enable their decarbonization



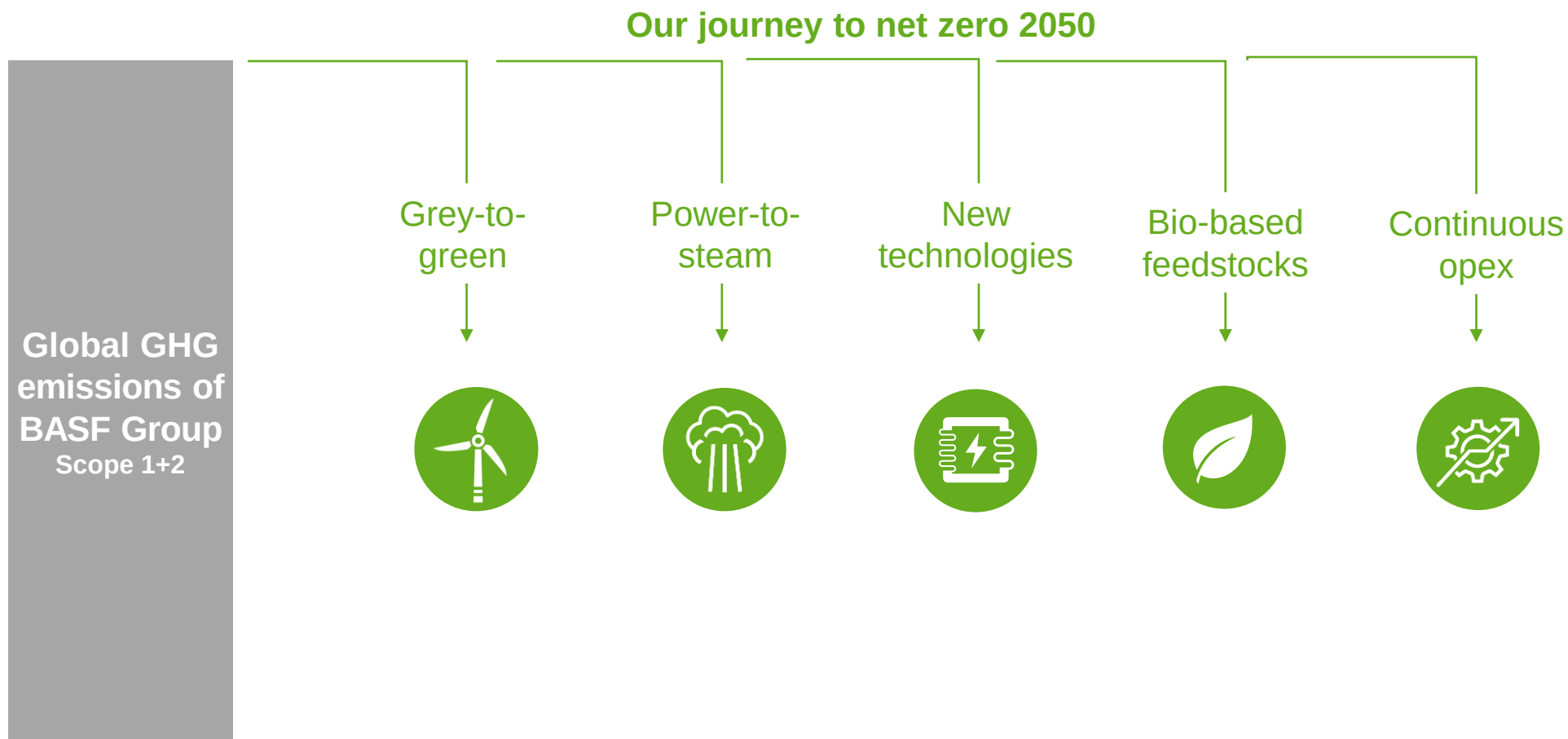
The transformation of the chemical industry needs a suitable policy framework

Climate protection and industrial policy need to go hand in hand to make new technologies successful and applicable

- To make low-carbon technologies competitive, global CO₂ pricing would be the best solution. As long as this is not the case, measures to ensure competitiveness are needed.
- Key element is the abundant and large-scale deployment of renewable electricity at competitive prices.
- Advancing ChemCycling™ will reduce the need for fossil C further.



Our levers to reduce BASF's CO₂ emissions



Increasing importance of renewable energy

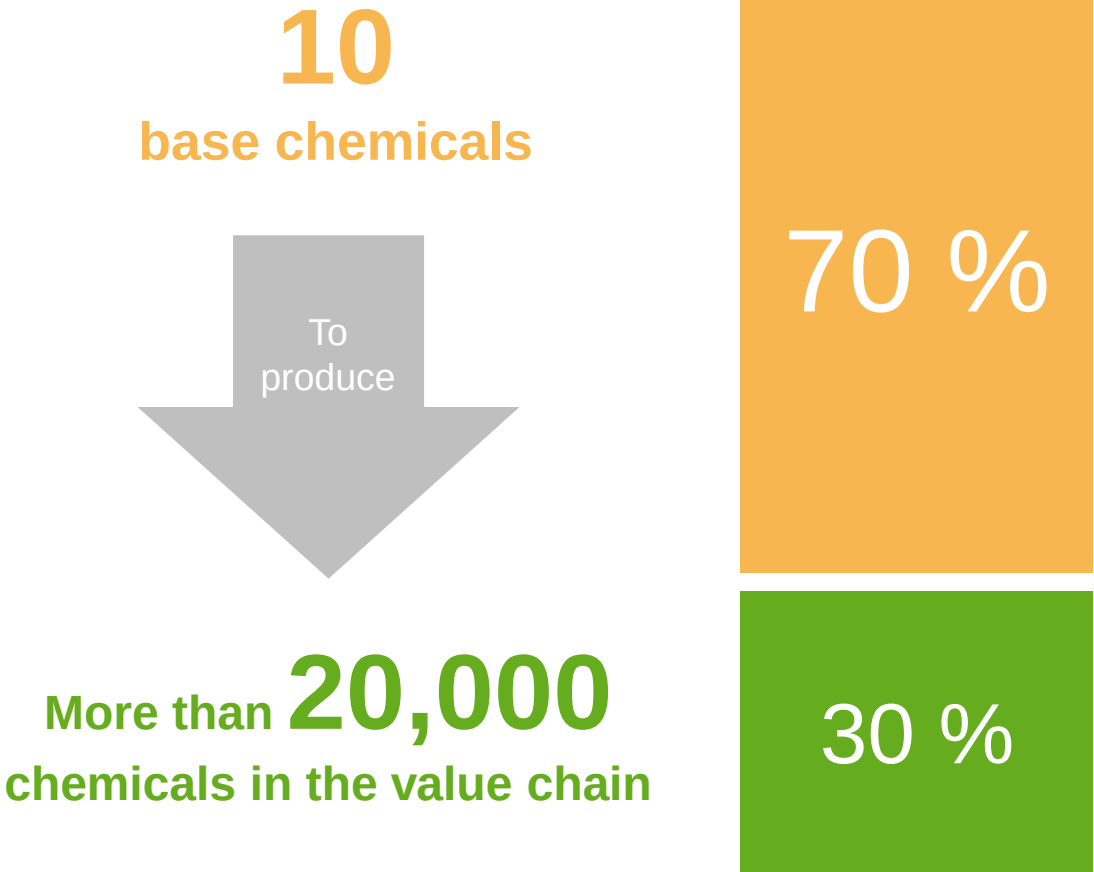


- In 2020, internally generated power in the BASF Group had an emission factor of around 0.24 metric tons of CO₂ per MWh of electricity and was below the national grid factor at most BASF Group locations (purchased electricity: around 0.41 metric tons of CO₂ per MWh)
- We are continuously optimizing processes, gradually replacing fossil fuels with renewable energy and developing new low-emission technologies to further reduce our overall CO₂ footprint.
- In 2020, 19 BASF sites in Europe, North America and Asia already source partially or fully emission-free electricity from suppliers.
- Availability and price of renewable power as critical success factors.
- BASF is investigating different options for renewable power supply.

Carbon Management R&D Program:

Base chemicals are in the focus of our research

Greenhouse gas emissions of the chemical industry in Europe



Process and energy related GHG emissions

Carbon Management R&D Program: Breakthrough process technologies for key petrochemicals

Examples:



**Methane pyrolysis for
CO₂-free hydrogen**

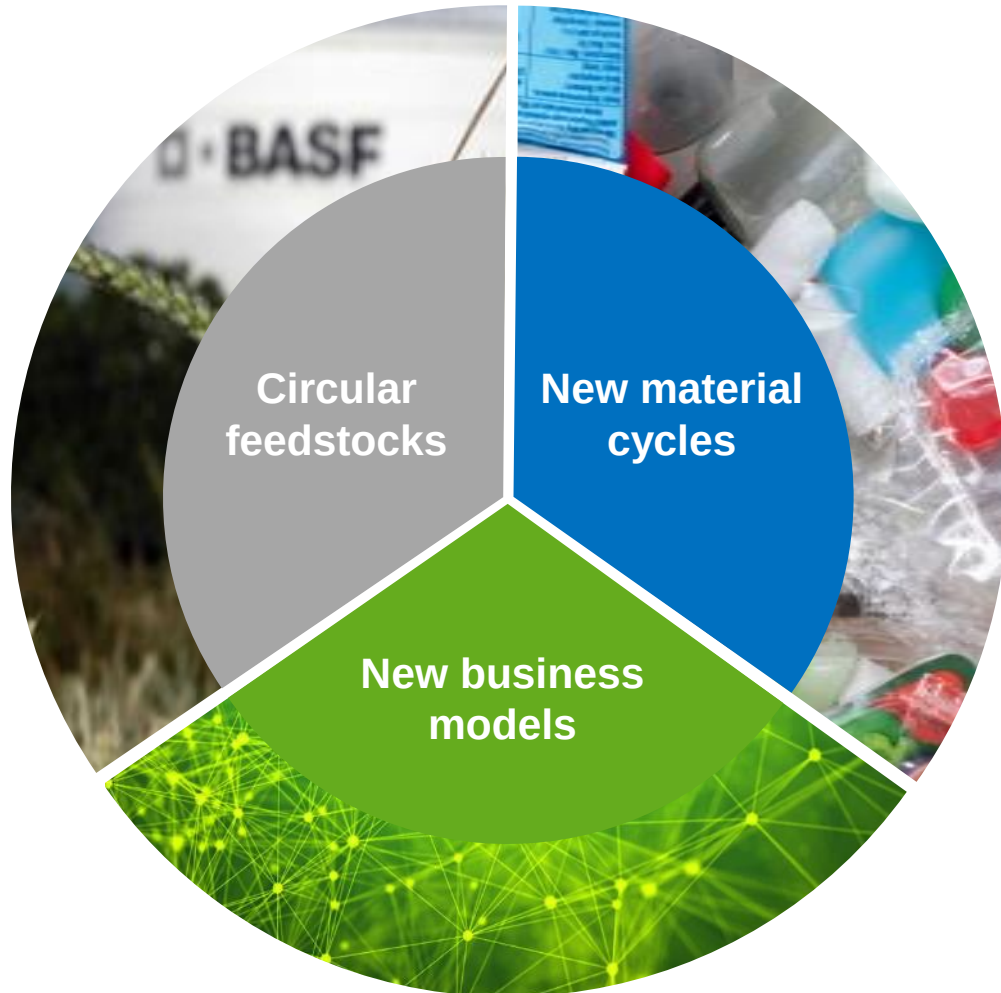


**eFurnace for electrification
of steam crackers**



**Dry reforming to produce syn-
gas from methane and CO₂**

We have three areas of focus: circular feedstocks, new material cycles and new business models



Circular feedstocks

We will increase the volume of renewable and recycled feedstocks from sustainable sources, also via the certified mass balance approach.

New material cycles

We design materials for circularity, develop solutions which improve or enable recycling and establish product-specific recycling loops.

New business models

We enter new markets, create smart digital solutions and offer new services which allow a decoupling of growth from resource consumption.

Innovate with us! Joint forces to address today's global challenges

A dedicated platform with ongoing and open collaboration opportunities to create partnerships with BASF experts and external specialists from industry, academia and start-ups

Collaborating
for a
sustainable
future



Ongoing Challenges:

Specific, application-oriented quests from our researchers to find experts for R&D projects

Open collaboration:

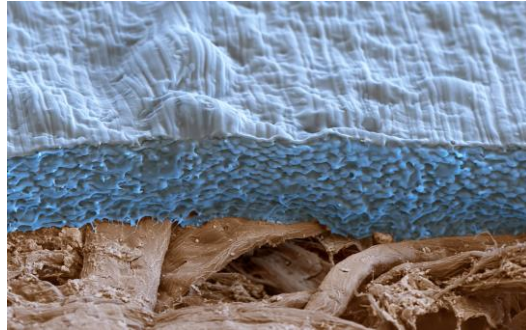
BASF constantly looks for experts from different fields and backgrounds taking the initiative to jointly foster new ideas

Take a look at www.basf.com/innovate-with-us

The global challenges are our tailwind for innovation

We create chemistry for a sustainable future

Climate Protection



Urbanity



Circular Economy



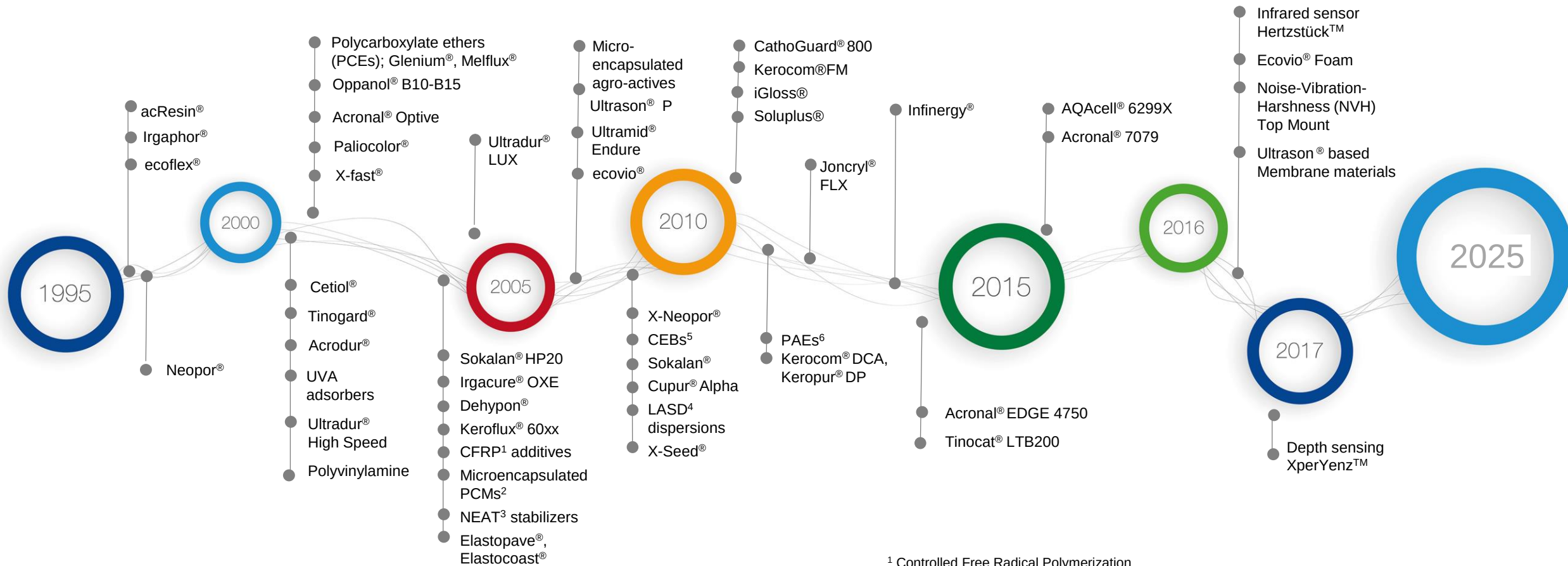
How can we ...

- cut our emissions and help customers cutting theirs?
- help to decouple growth from our resource consumption?
- help to improve city life through our innovations?



We create chemistry

Our innovations enabled key product launches for our customers around the globe



¹ Controlled Free Radical Polymerization

² Phase Change Materials

³ Novel Encapsulated Additive Technology

⁴ Liquid-Applied Sound Damping

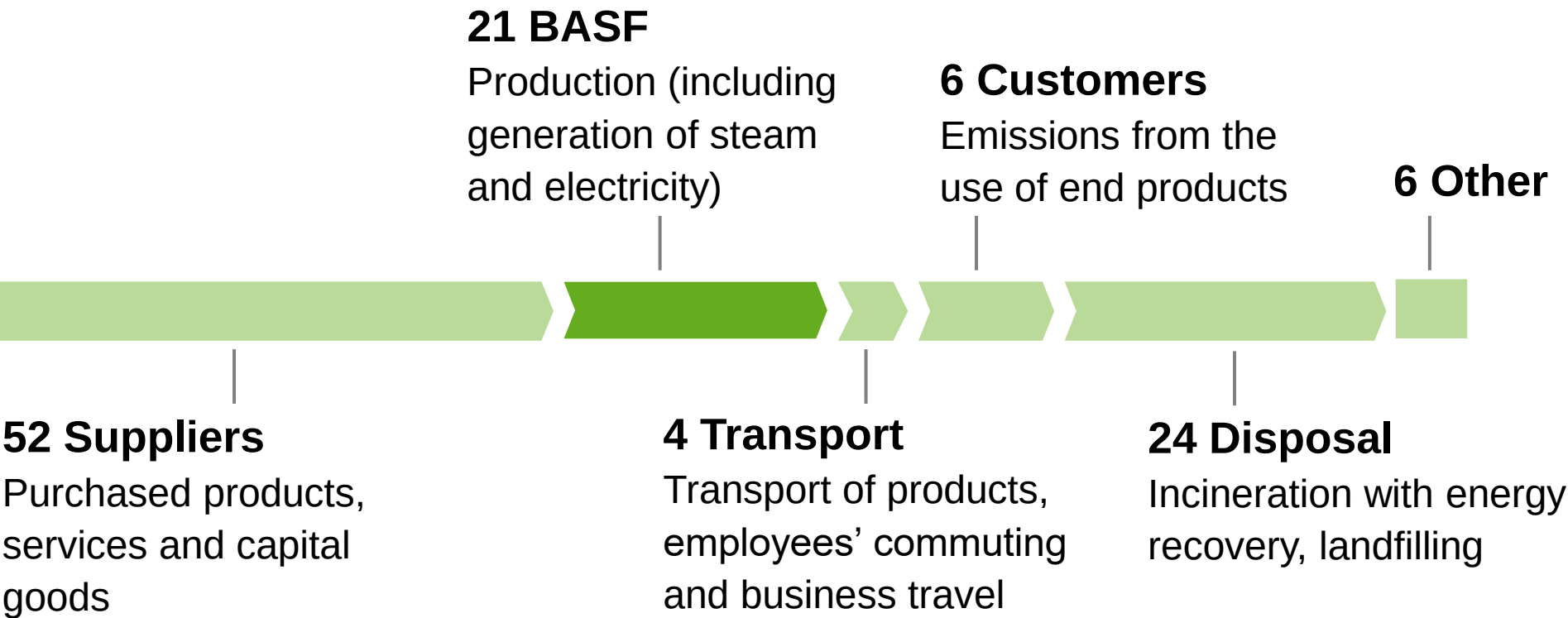
⁵ Cost Efficient Binders

⁶ Polyacylether dispersants

We assume responsibility along the entire value chain

Greenhouse gas emissions along the BASF value chain in 2020*

(in million metric tons of CO₂ equivalents)



* Excluding polyamide business acquired from Solvay

Higher efficiency and enhanced decision making in our manufacturing process with digital technologies

Examples:



Predictive Maintenance

Rollout



Augmented Reality

Rollout



Process Optimization by Big Data

Pilot



Vertical Integration

Pilot

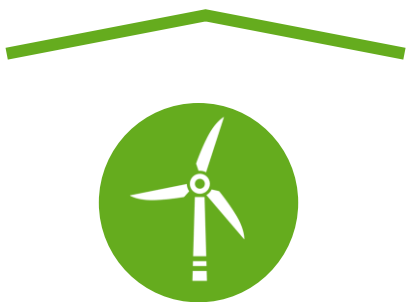


Digital Plant

Pilot

We are a key enabler to help our customers decarbonize their value chains

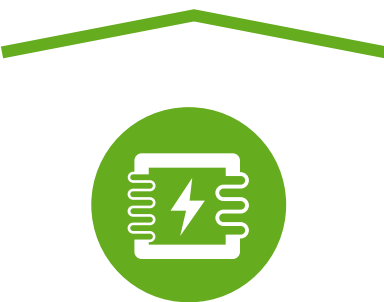
Low-carbon products



Grey-to-green



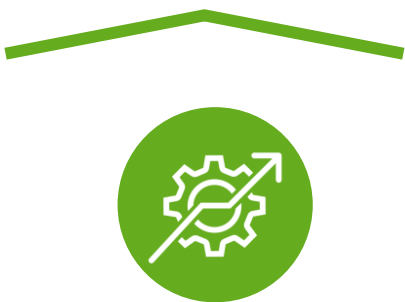
Power-to-steam



New technologies



Bio-based feedstocks



Continuous opex



We create chemistry