

*Wirtschaftstag Japan 2023*

# **Target 2050 – Transition of the energy and emission intensive industries**

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22. Mai 2023 – Nachhaltigkeit in Handel, Dienstleistung und  
Industrie: Treiber für die Wirtschaft – Düsseldorf

Prof. Dr. Stefan Lechtenböhmer | Wuppertal Institut

## Mission of the Wuppertal Institute

Research for a sustainable development

- The Wuppertal Institute undertakes research and develops models, strategies, and instruments for **transitions to a sustainable development** at local, national and international level
- Sustainability research at the Wuppertal Institute focuses on the **resources, climate and energy related challenges** and their relation to economy and society
- Special emphasis is put on analysing and stimulating **innovations that decouple economic growth** and wealth from natural resource use



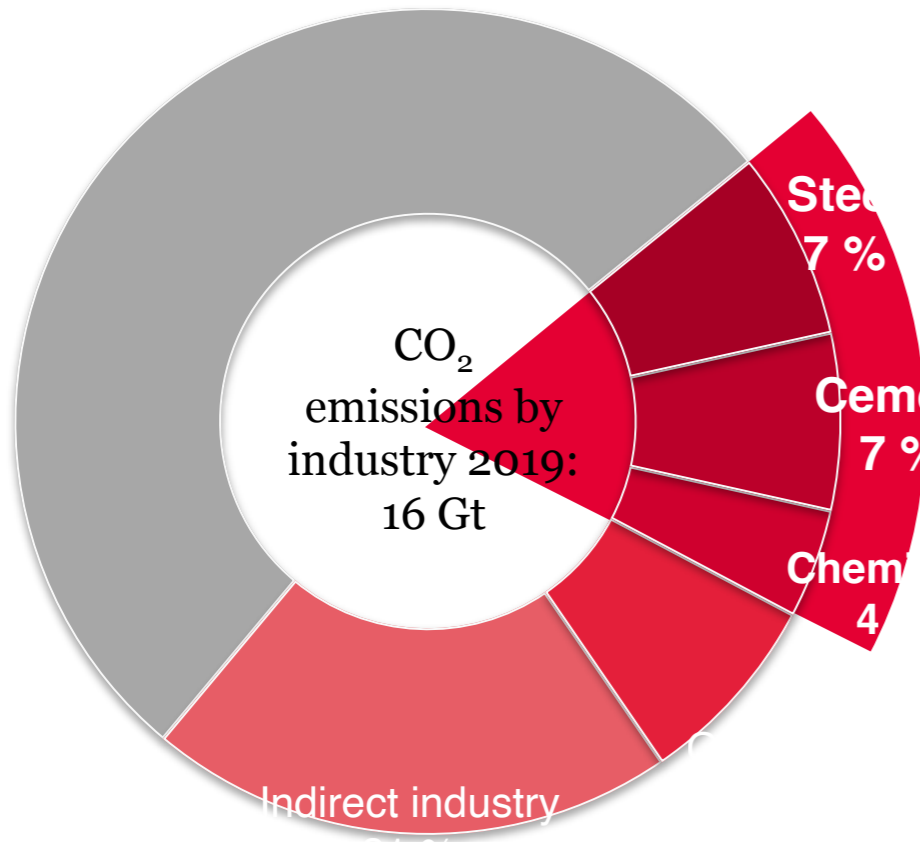
# Why an industry transition to net zero is necessary and urgent

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# Industrial transition is necessary

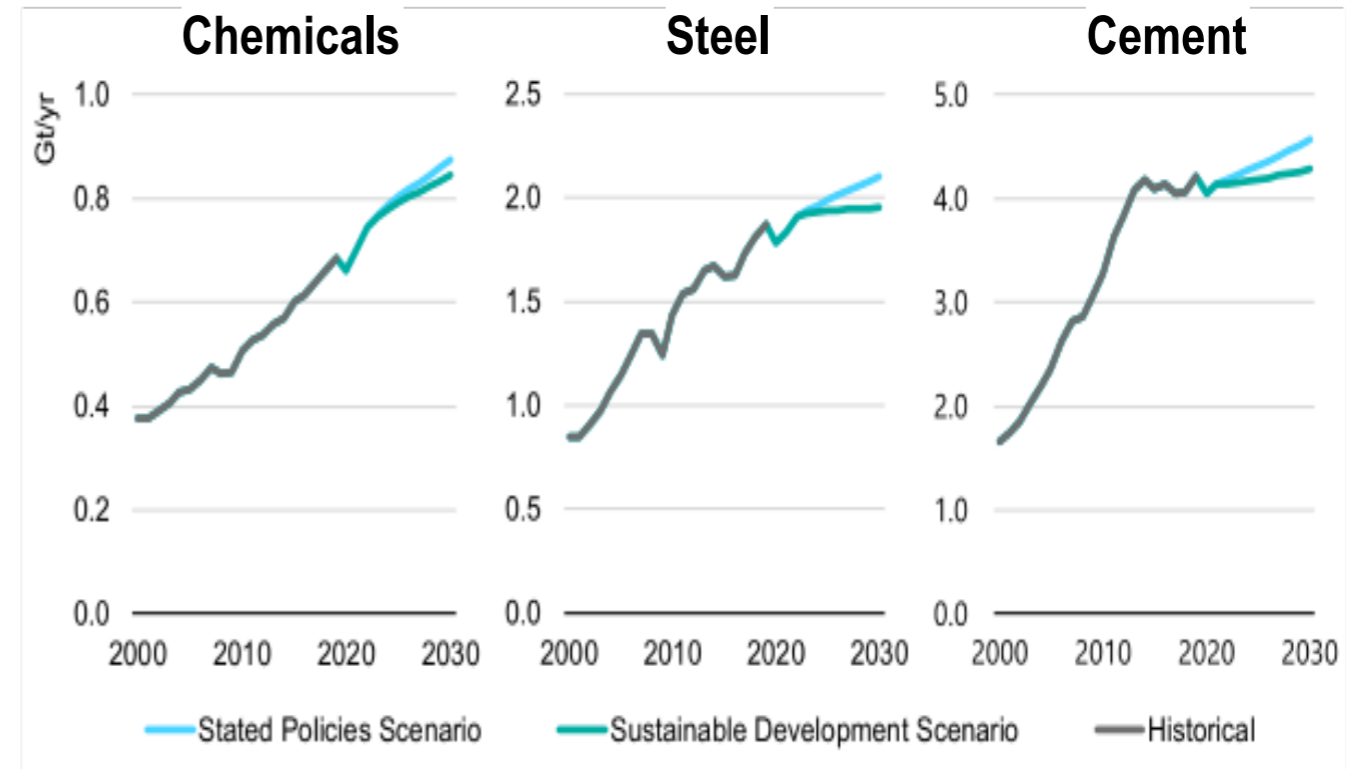
Material conversion is the most GHG intensive step of the material and the energy system

3 basic industries directly emit 19% of global energy related CO<sub>2</sub> emissions...



Source: own figure based on IEA ETP 2020 (4), data for 2019 (includes process emissions)

... and the demand for basic materials is expected to rise further (scenarios for 2030 by IEA)



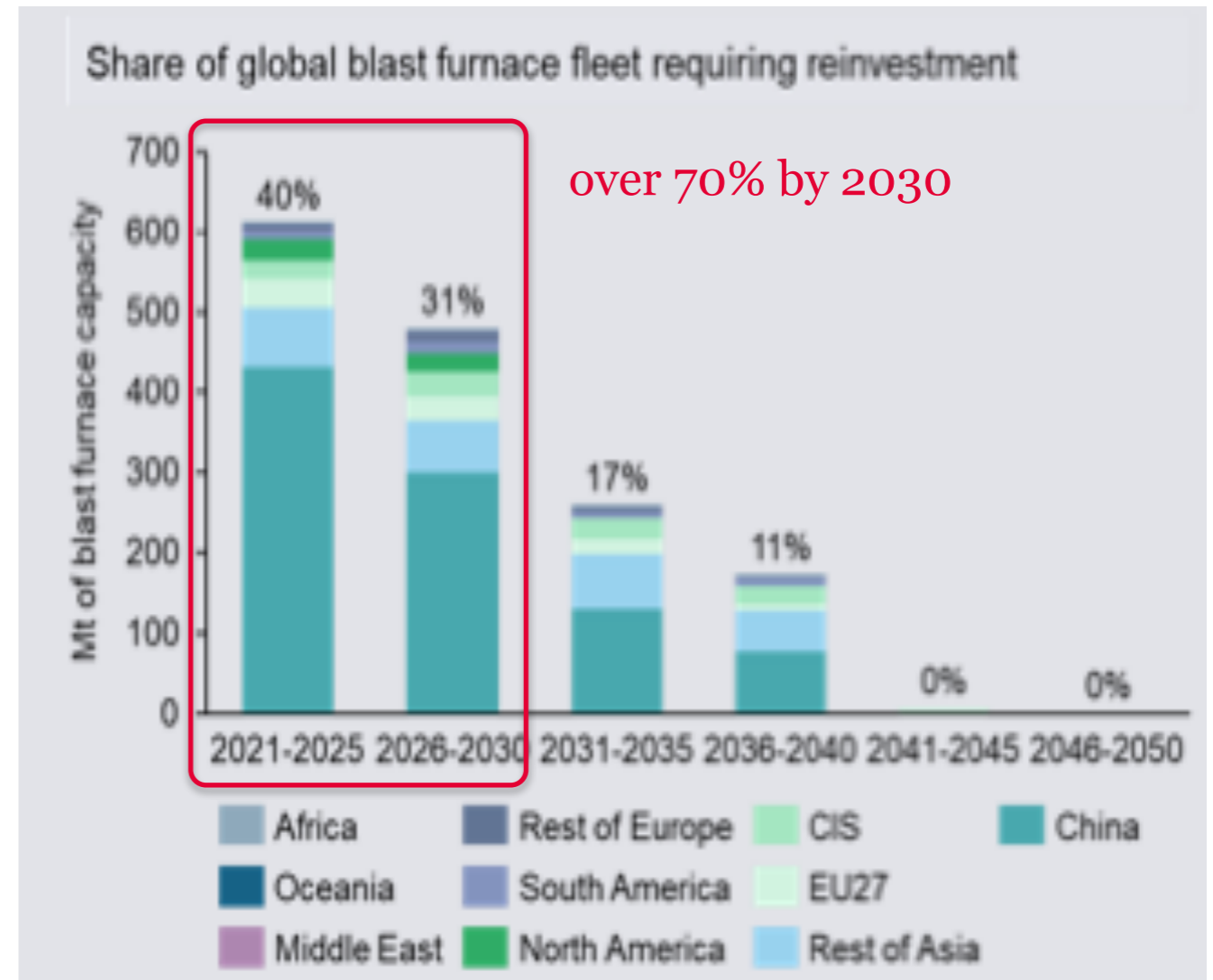
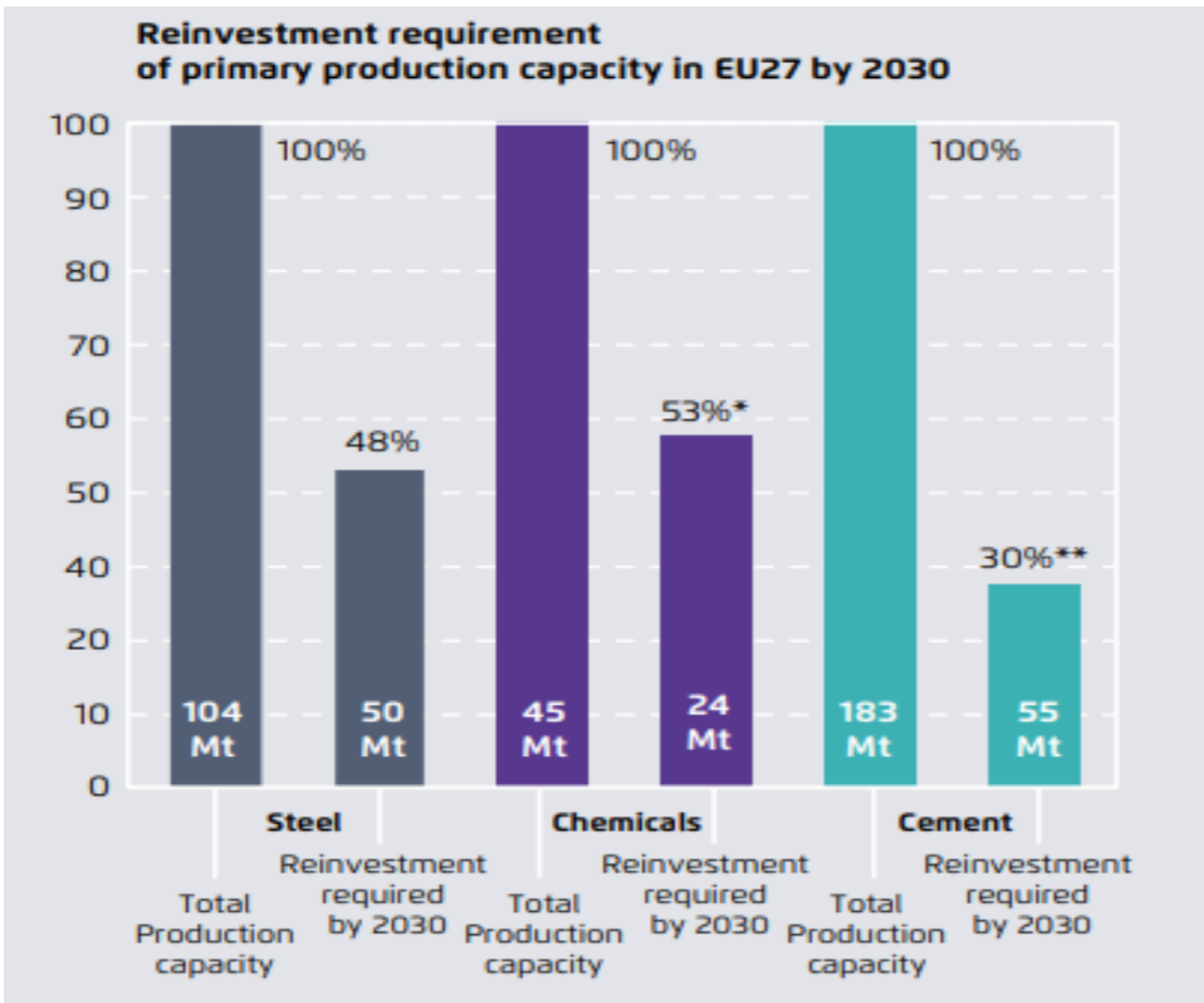
IEA 2020. All rights reserved.

Note: Chemicals includes the primary chemicals ethylene, propylene, and benzene, toluene, mixed xylenes, ammonia and methanol as an aggregate proxy for sector activity growth.

# Industrial transition is urgent

## Climate neutrality 2050 is only one investment cycle away

All investments from now on must be compatible with climate neutrality



## Industry is starting the transition

Over 50% of German industrial companies planned to become carbon neutral  
80% of them by 2025 or earlier

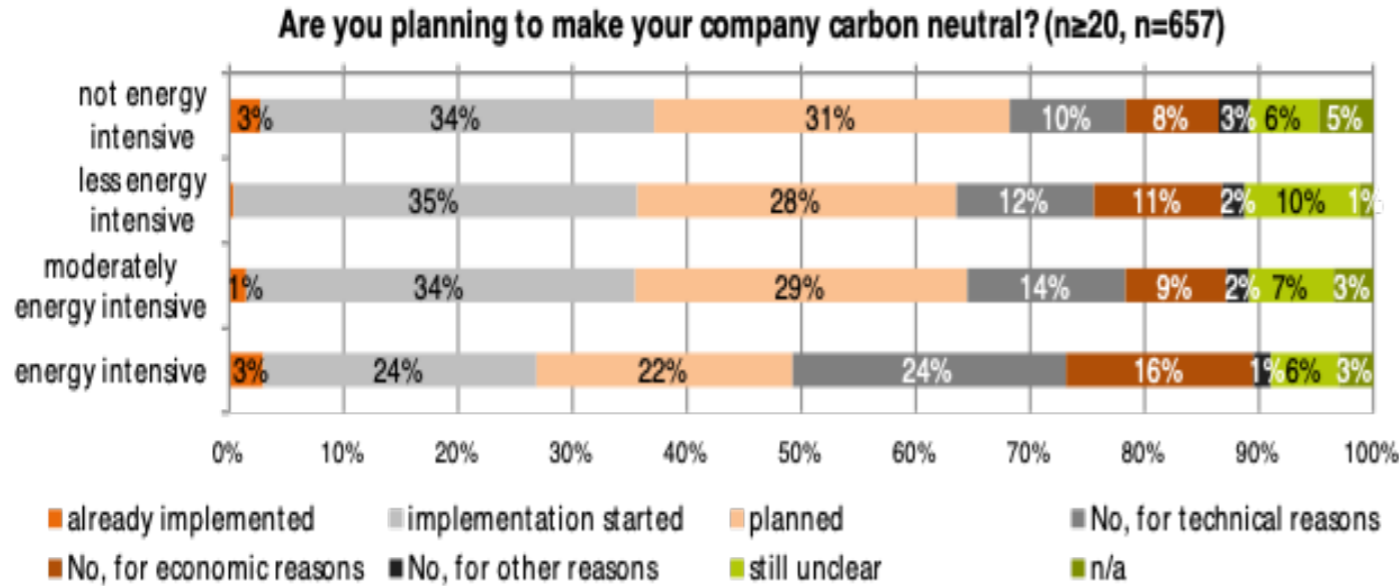


Figure 4.2: Plans to become net zero carbon, by energy intensity

Survey from 2020

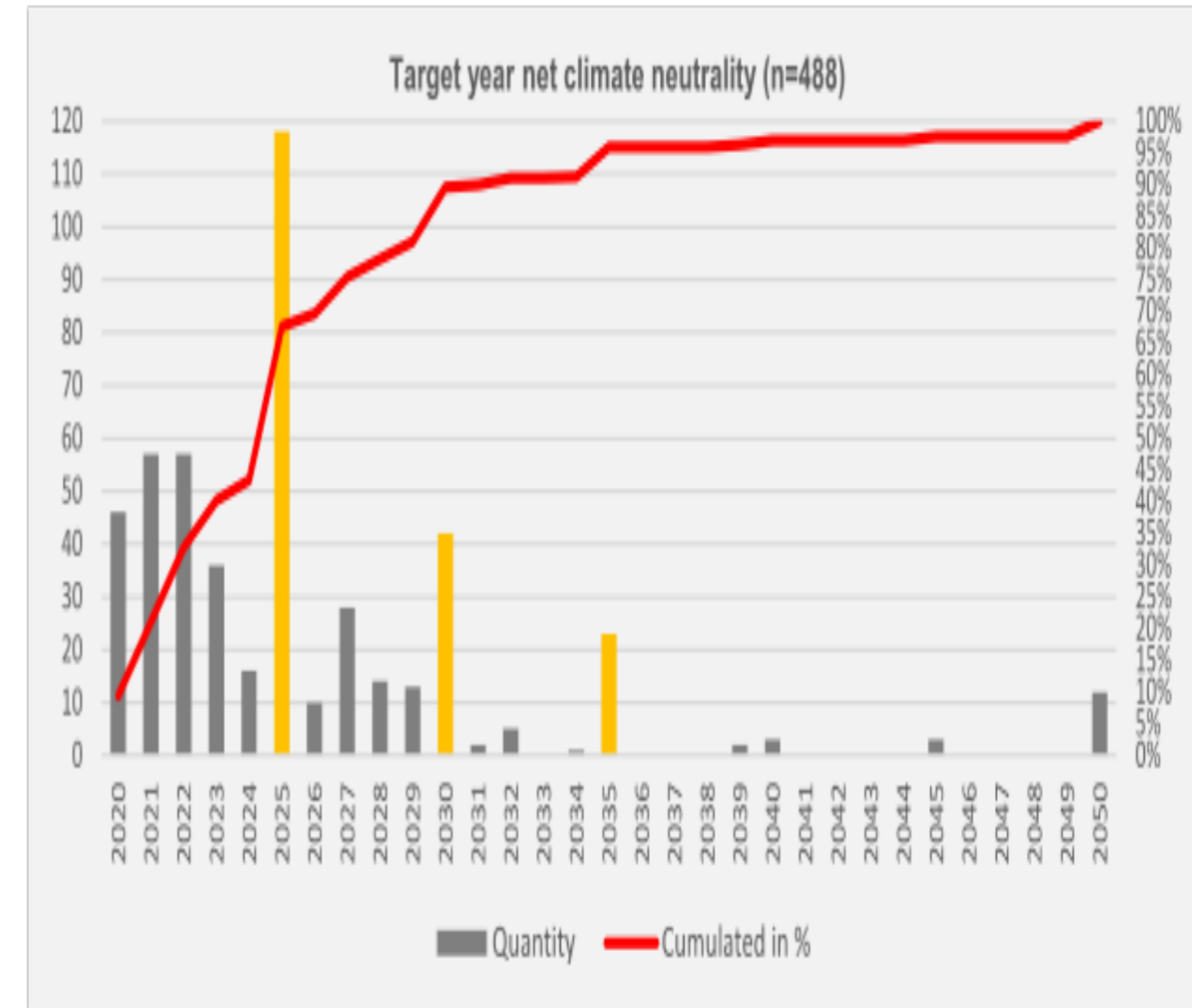
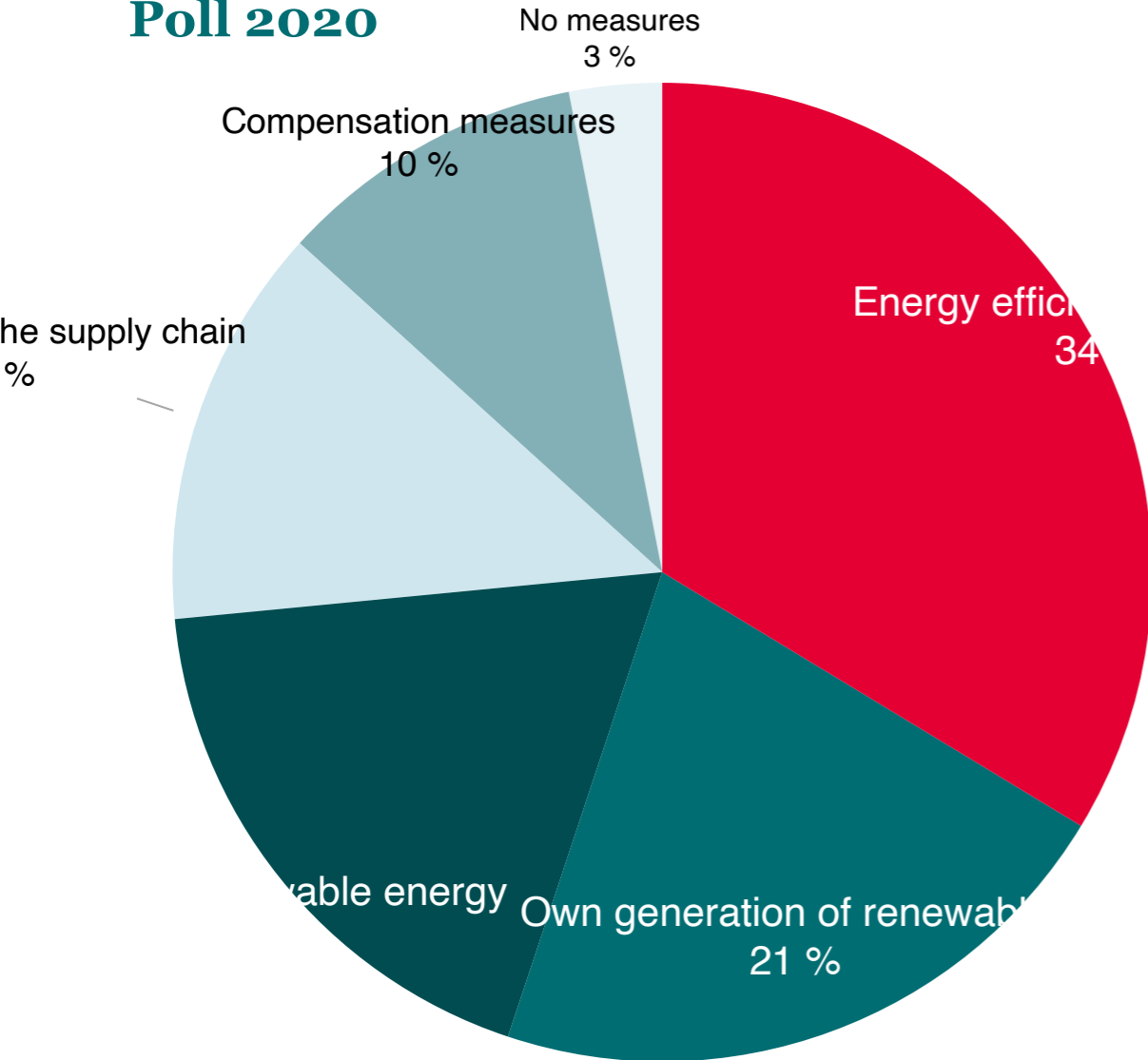


Figure 5: By when do companies plan to reach net carbon neutrality?

# What are the concrete plans and how have they changed since 2020

Energy efficiency has doubled in relevance in 2022

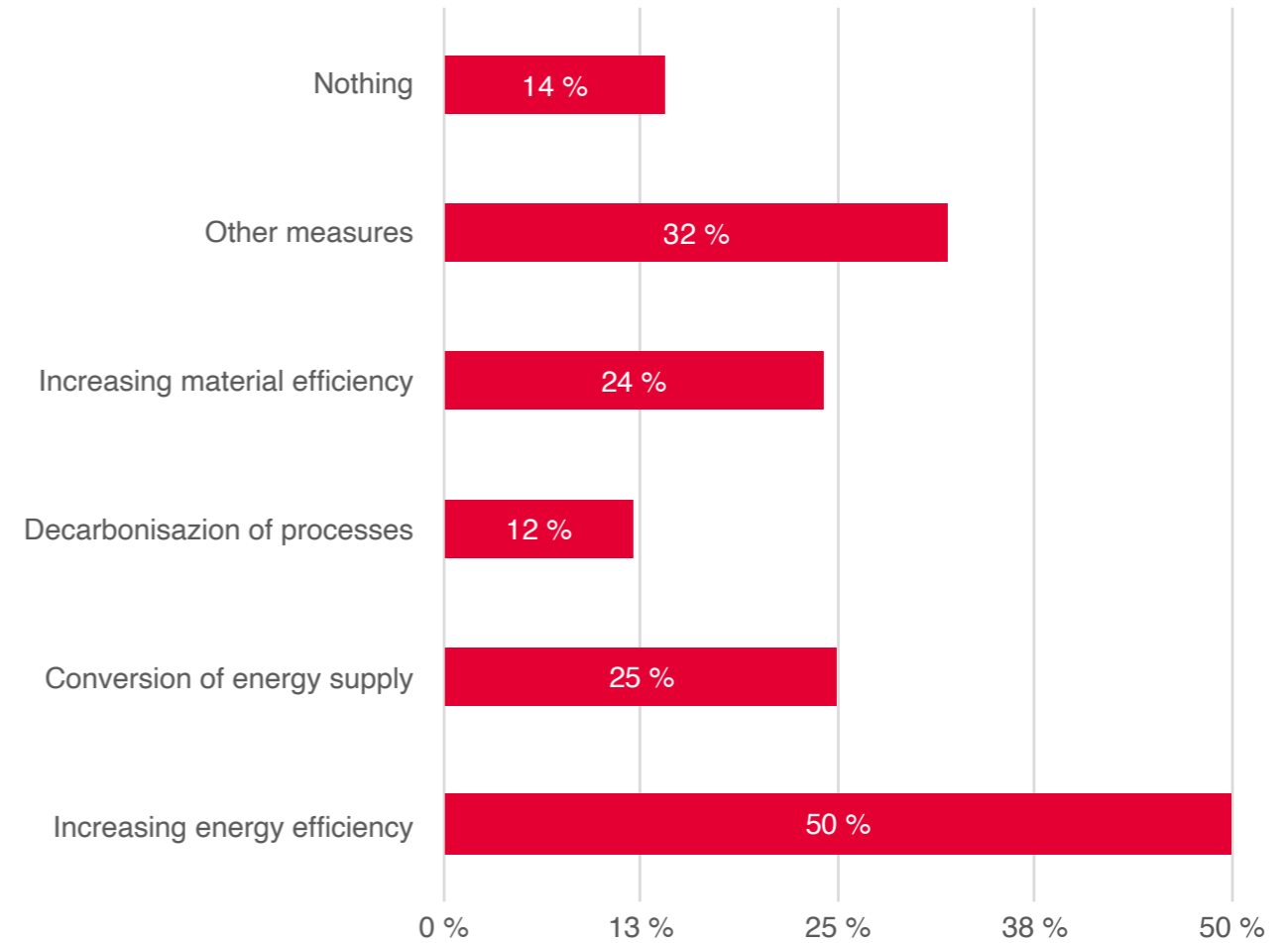
## Poll 2020



Source: Büttner, S. et al. (2020): How does the German industry react to the calls to decarbonise?, Working paper

## Poll 2022

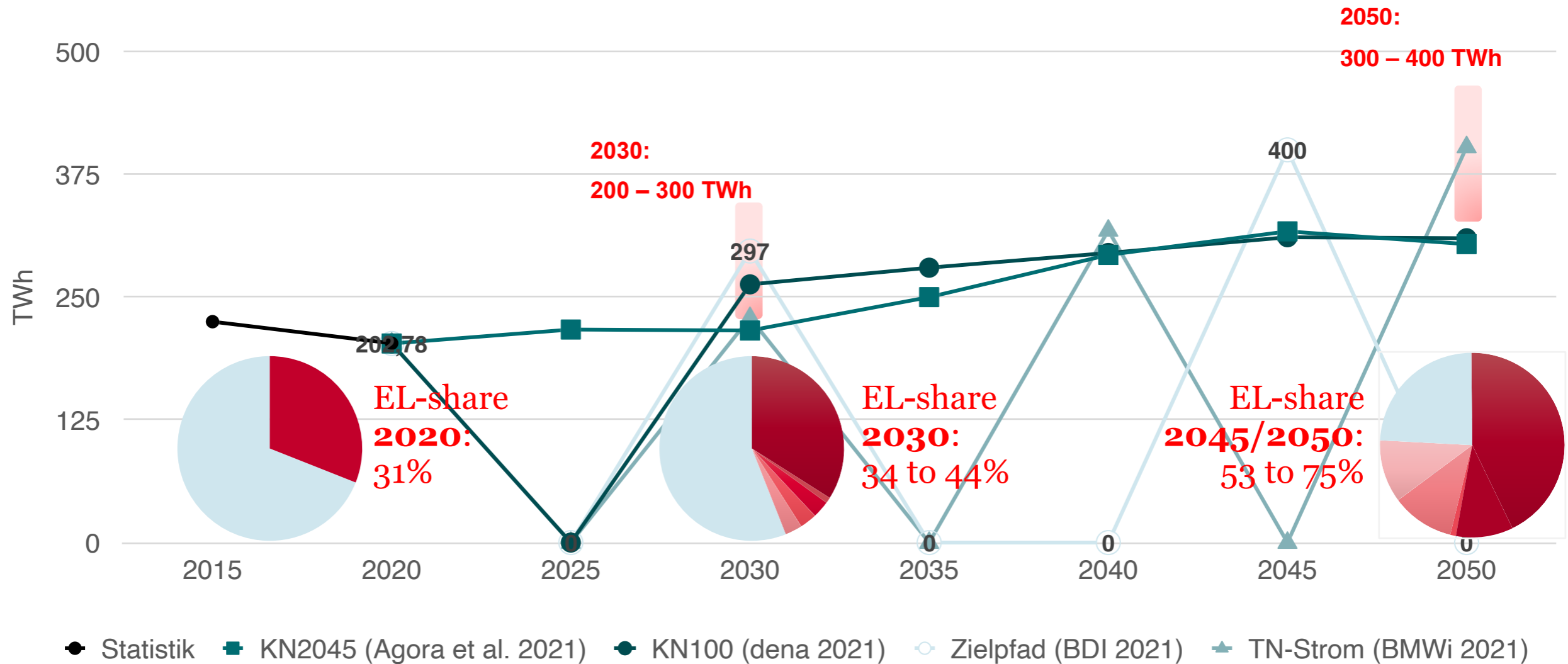
Stated reactions of German industrial enterprises on the recent energy crisis



Source: EEP University of Stuttgart, 2022 (n=865, n'=1371)

**Electrification as core strategy → roughly from 1/3 to 2/3**  
 (without electricity used for H2 electrolysis)

Electricity becomes the dominating final energy in industry  
 But we see a vast range between studies

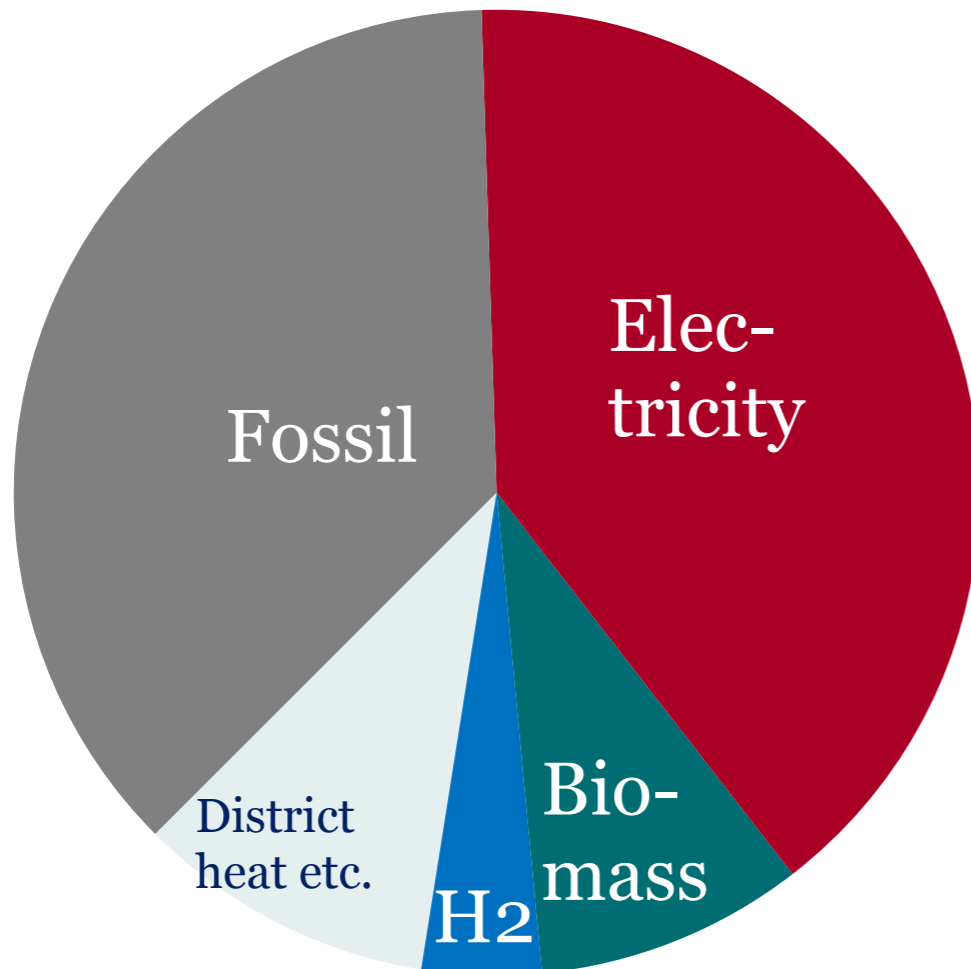




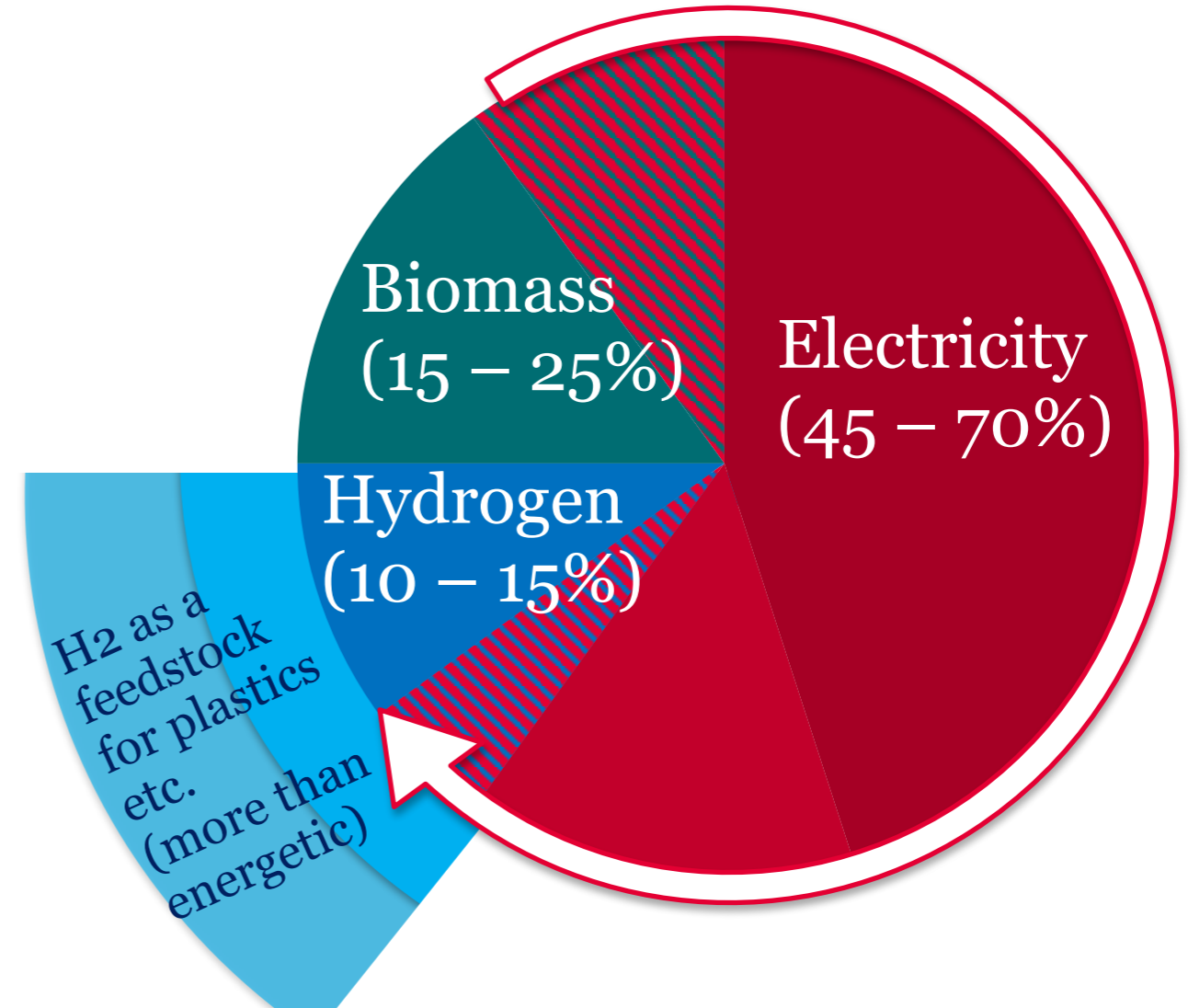
# Industrial final energy demand, 2030 und 2050

(Ranges from recent scenarios)

2030



2050



# Electrification often enables high efficiency gains

Example: Brick kiln, Austria

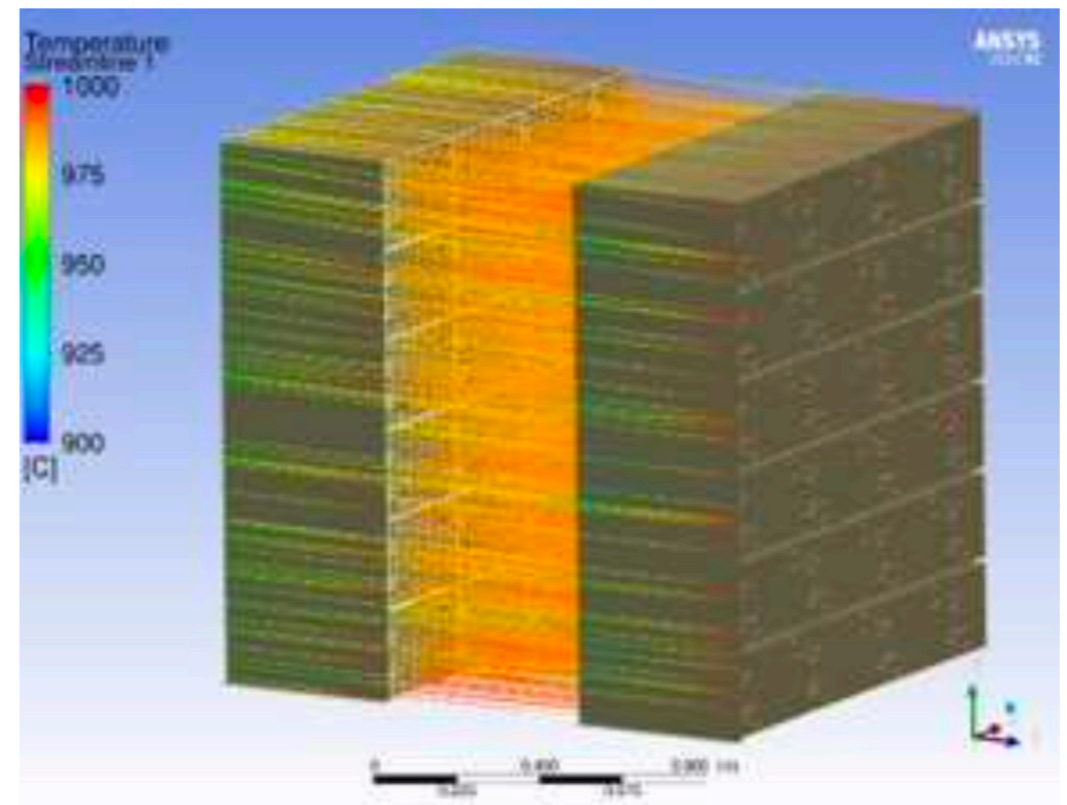
WIENERBERGER ESG PROGRAM

## NEW KILN TECHNOLOGY, UTTENDORF (AUSTRIA) CLAY BLOCK PRODUCTION WITH NEARLY ZERO CARBON FOOTPRINT

wienerberger

**FFG**  
Forschung wirkt.

- › Replacement of old gas fired tunnel kiln with a new tunnel kiln heated by green electricity and **>50% better thermal efficiency**
- › Drying process based (mainly) on **heat pump technology**
- › **Limited impact of fuel switch on production cost** due to lower energy consumption of new kiln
- › Project in implementation, **2022-2024**
- › **Carbon footprint improvement ~90% vs. today** (fuel & process CO<sub>2</sub>)



### Key energy supply trends for smaller or less energy intensive industries

- **Electrification** will be the key technology
  - Combined with heat pumps and other innovative technologies
- **Hydrogen** will be available along core backbones and widespread supply will be late
  - Some suppliers will try to repurpose parts of their gas grid to supply industries with hydrogen/green gases
- **Diverse local energy solutions** such as bioenergy, geothermal, heat grids will play a role, depending on local potentials

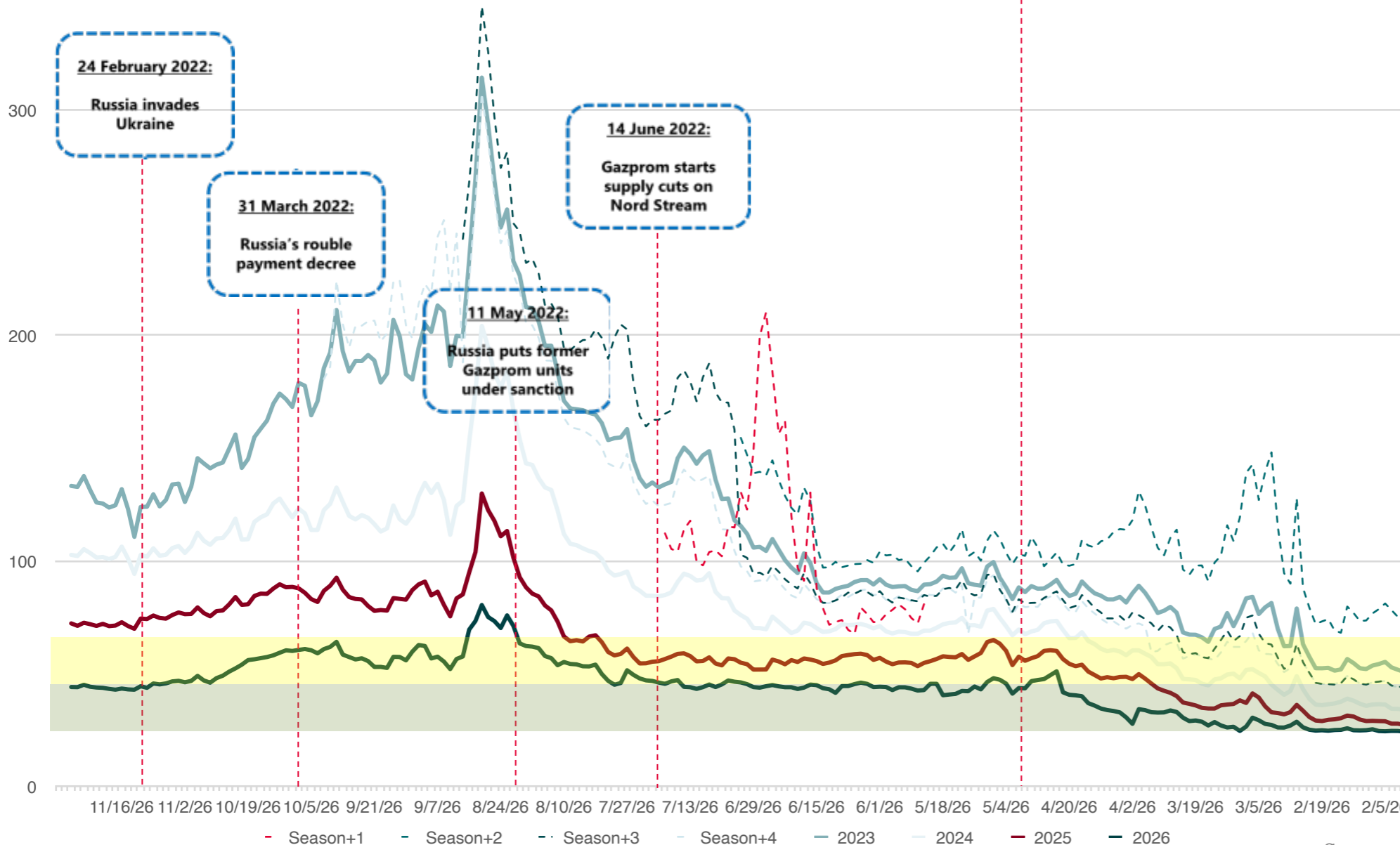
### Key strategies for smaller industrial actors

- Prepare for **higher energy costs**
  - Utilise efficiency gains from electrification
- Closely **cooperate** with local partners
  - to develop local green energy solutions
- Develop **own RES generation** (on-site and off-site)
- Purchase green electricity via **PPAs**
  - There might emerge special offers for small scale PPA-like RES contracts

# The energy price shock as an accelerator?

# The gas price „shock“ of summer 2022

Natural Gas Prices Germany (THE, €/MWh)

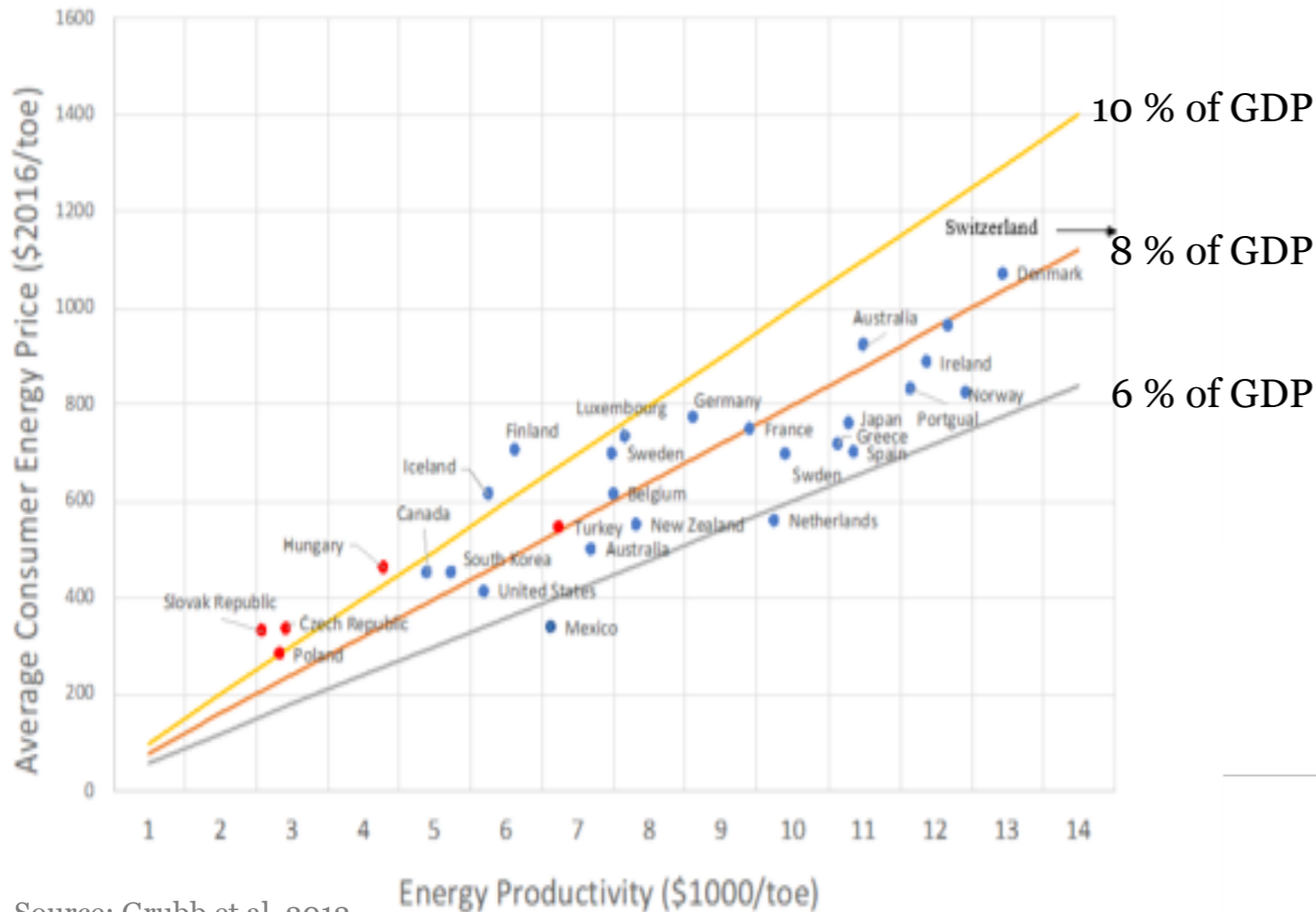


- Gas prices saw extreme peaks in 2022
- Together with shortages in European electricity markets this also lead to extreme electricity prices
- Currently gas futures are back to about 40 to 60 €/MWh
- electricity futures are at about 130 €/MWh (and further declining towards 100 in 2026)

High energy costs in an economy typically result in low GDP share of energy expenditures  
 Mid-term structural price increase will lift Germany as a whole from lower range to middle

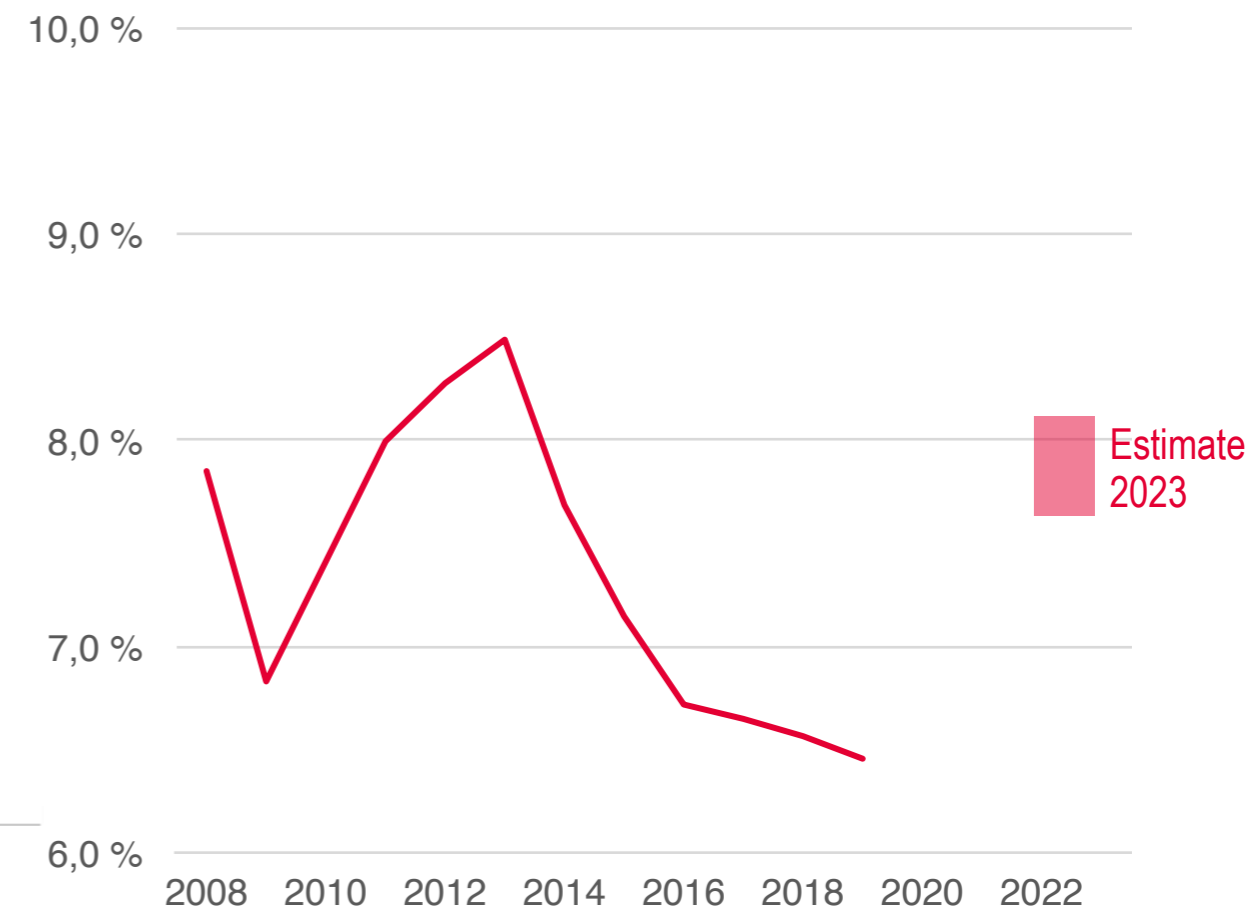
Energy costs vs. GDP (1971 – 2012 averages)

Energy Price vs Energy Productivity (1971-2012 average)



Source: Grubb et al. 2012

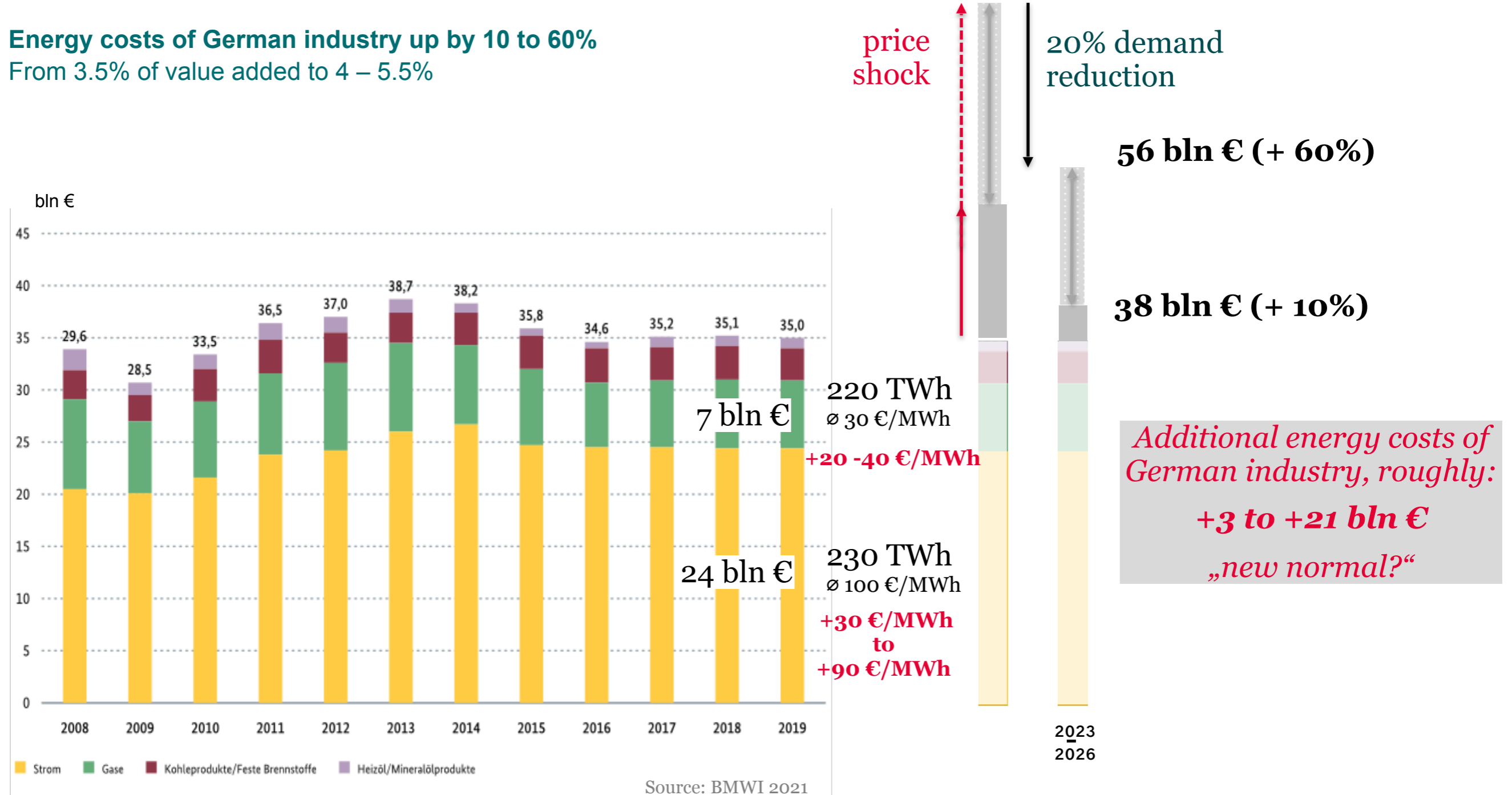
Final energy expenditures vs. GDP Germany 2008 – 2019



Source: Own calculations

# Transition as a way to shield off energy price shocks

Energy costs of German industry up by 10 to 60%  
From 3.5% of value added to 4 – 5.5%

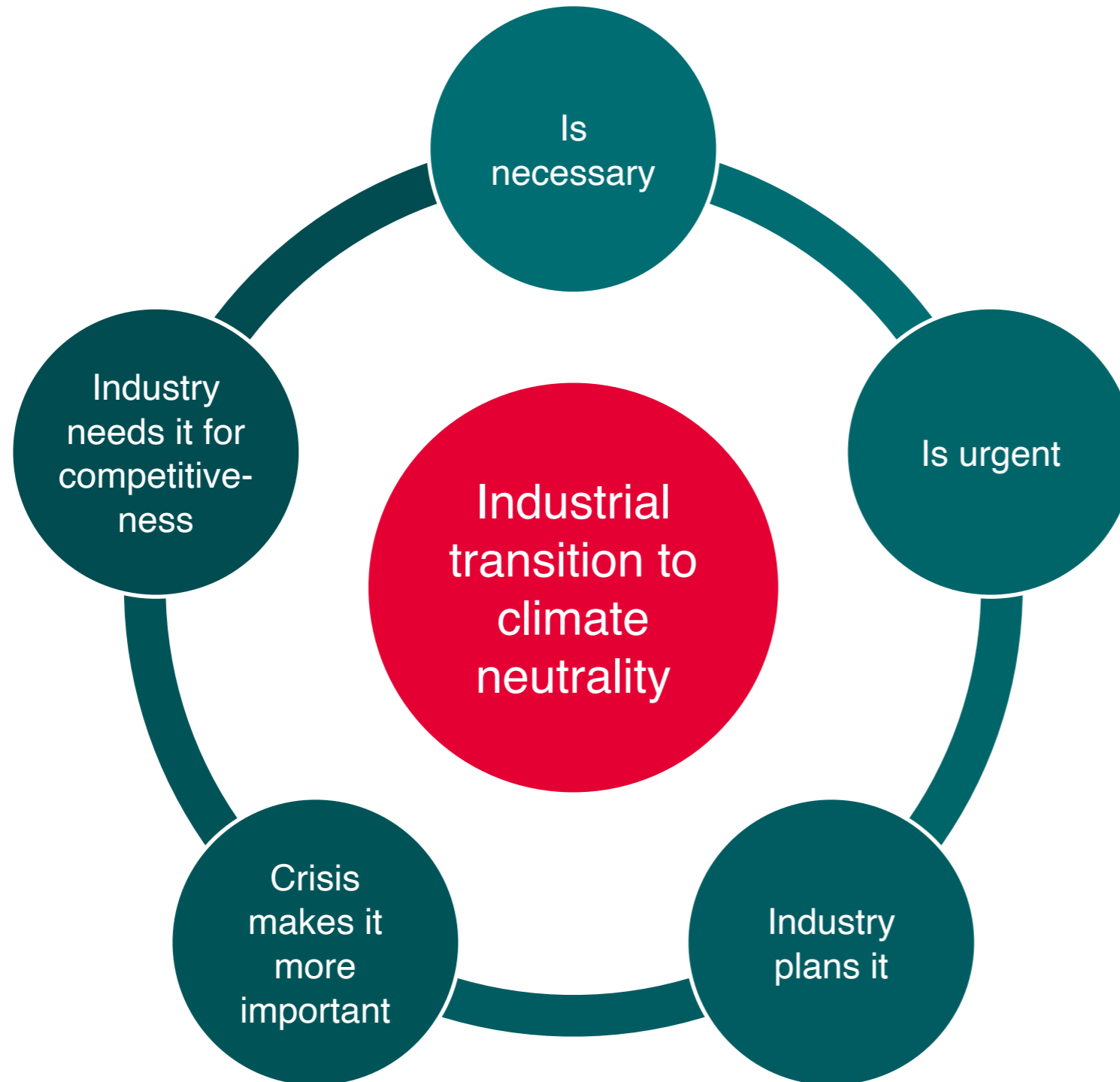


Quelle: Eigene Berechnungen BMWi auf Basis von AGEB und StBA 06/2020 (Werte für 2019 geschätzt)

Source: BMWI 2021

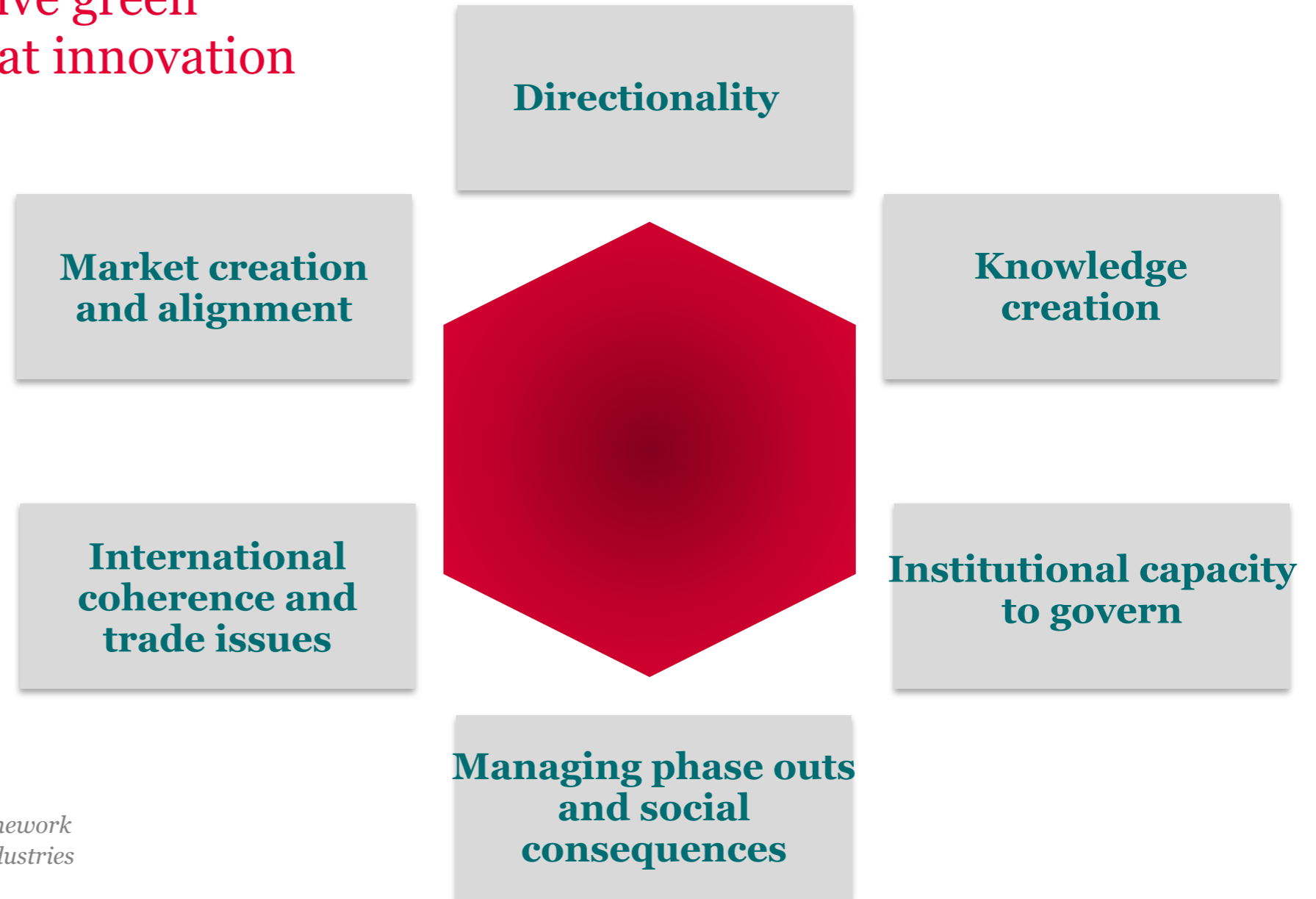
**An integrated climate-industrial policy is needed!**



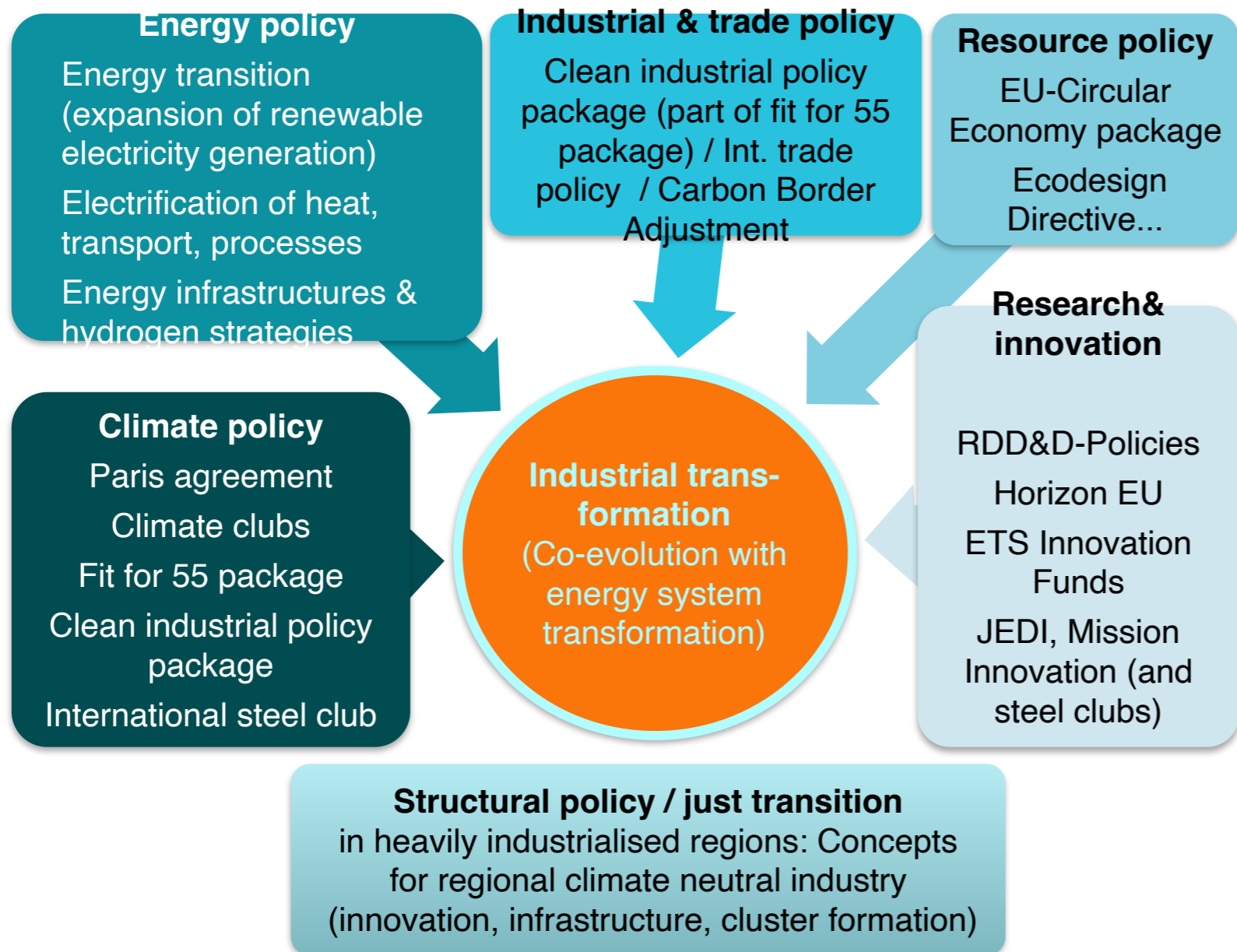


**How to  
achieve the  
transition *in  
a hurry?***

**Six pillars** for an effective green industrial policy aiming at innovation



Source: Nilsson et al 2021 ) *An industrial policy framework for transforming energy and emissions intensive industries towards zero emissions*, Climate Policy, 21:8



## A new paradigm of a climate and industrial policy

would best be

- *Clearly target oriented* towards sustainability and climate neutrality as core long term targets (→ fit f. 55 pack.)
- *Integrating* policies for climate, energy, innovation and resource efficiency with trade, growth and structural policies (→ fit for 55 package)
- And *creating a new mode of societal cooperation* of all societal stakeholders

**The EU green deal is the right approach but  
needs strong implementation**

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# EU-Green Deal (19.12.2019)

First climate neutral  
continent by 2050

Decoupling of growth and  
resource use

„Leave nobody behind“

REPowerEU

...

## Fit for 55 Package

ETS, CBAM, Effort Sharing  
Dir.

Fuel standards

Renewable energies  
(RED)

Energy efficiency (EED,  
EPBD)

...

## Fit-for 55 for industry

ETS, CBAM,

Sustainable Product  
Initiative,

RED / 3. gas package,  
TEEN, IPCEI,

Innovation funds,

State aid rules

# EU-Green Deal (19.12.2019)

First climate neutral  
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Decoupling of growth and  
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REPowerEU

...

## Fit for 55 Package

ETS, CBAM, Effort Sharing  
Dir.

Fuel standards

Renewable energies  
(RED)

Energy efficiency (EED,  
EPBD)

...

## Net Zero Industry Act

Technology targets and  
targeted subsidies

*(mainly focussing energy  
technologies)*

EU state fund

State aid rules

Speeding of  
permissions



**Thank you  
for your attention**

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BMWI (2021): Die Energie der Zukunft, 8. Monitoring-Bericht zur Energiewende – Berichtsjahre 2018 und 2019

Büttner, S. et al. (2020): How does the German industry react to the calls to decarbonise?, Working paper

EEP University of Stuttgart, 2022

Grubb et al. (2018): An exploration of energy cost, ranges, limits and adjustment process, Final report to the Institute for New Economic Thinking, Published by UCL Institute for Sustainable Resources March 2018

Hermwille, L. (2019). Exploring the Prospects for a Sectoral Decarbonization Club in the Steel Industry (Deliverable D4.3d). COP21 RIPPLES Project (Horizon2020). <https://www.cop21ripples.eu/resources/deliverable-4-3/>

IEA (2020): Energy Technology Perspectives, Paris

Joas, F., Lechtenböhmer, S. et al (2019): Klimaneutrale Industrie : Schlüsseltechnologien und Politikoptionen für Stahl, Chemie und Zement ; Studie im Auftrag von Agora Energiewende, Berlin

Lechtenböhmer, S. & Fishedick, M. (2020): An Integrated Climate-Industrial Policy as the Core of the European Green Deal, InBrief 09/2020, Wuppertal Institut

Lars J. Nilsson, Fredric Bauer, Max Åhman, Fredrik N. G. Andersson, Chris Bataille, Stephane de la Rue du Can, Karin Ericsson, Teis Hansen, Bengt Johansson, Stefan Lechtenböhmer, Mariësse van Sluisveld & Valentin Vogl (2021): An industrial policy framework for transforming energy and emissions intensive industries towards zero emissions, Climate Policy, DOI: 10.1080/14693062.2021.1957665

Witecka, W. K, Lechtenböhmer, S. et al. (2021): Breakthrough Strategies for Climate-Neutral Industry in Europe. Policy and Technology Pathways for Raising EU Climate Ambition. STUDY on behalf of Agora Energiewende, Berlin



