

Agora
Energiewende



Towards a Climate-Neutral Germany

3 Steps for Achieving Climate Neutrality by 2050

Dr. Patrick Graichen

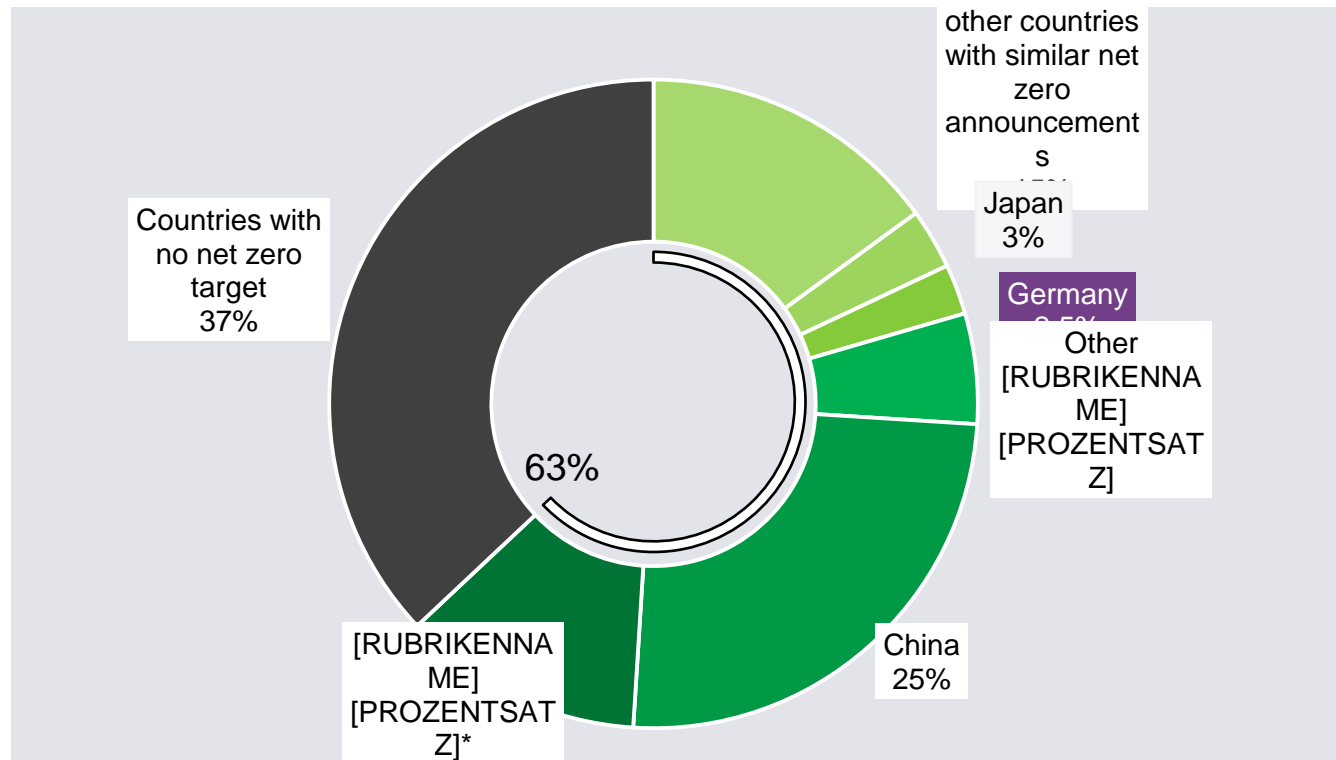
BERLIN, 11 MARCH 2021



Climate neutrality

...is the new paradigm for the global economy – countries covering >60% of global are committing to it!

Share of world's greenhouse gas emissions in 2020



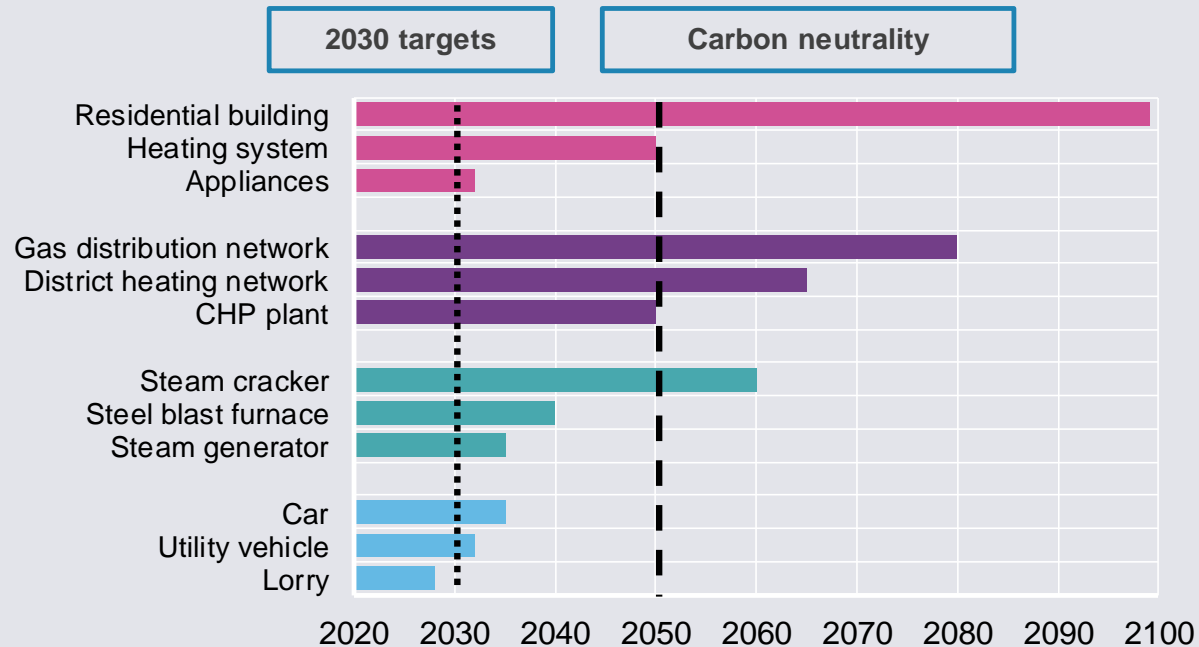
New Climate Institute (2020), ECIU (2020), EDGAR (2019) – updated March 2021

- Five years after the adoption of the Paris agreement, 2020 saw many countries committing to climate neutrality targets by the middle of this century or soon after. Those countries cover 63% of global greenhouse gas emissions.
- This means that we now see a race between the regions towards climate neutral technologies: Who can supply what to the rest of the world?

Why the climate neutrality paradigm has direct implications on today's investments:

→ investments have a long lifetime

Lifetime of specific technologies if reinvestment takes place in 2020

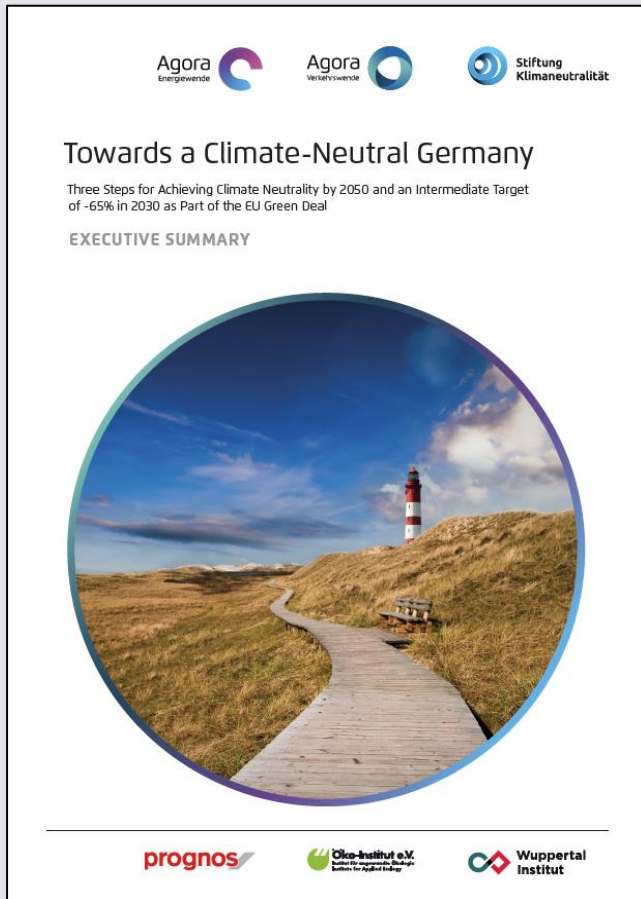


Own illustration

- Many investments of the upcoming years will still be used in 2030 and 2050 when climate targets are evaluated.
- Houses last 80-100 years, grids 50-60 years, industrial sights 20-40 years, heating systems 30 years, cars 10-15 years.
- From a macroeconomic perspective, efficient policies take these investment cycles into account and allow for direct and intelligent investments that are climate-friendly.
- If this is not guaranteed, investments may strand or expensive scale-ups are required. This would neither be economically sustainable nor resource-saving.

Towards a Climate-Neutral Germany

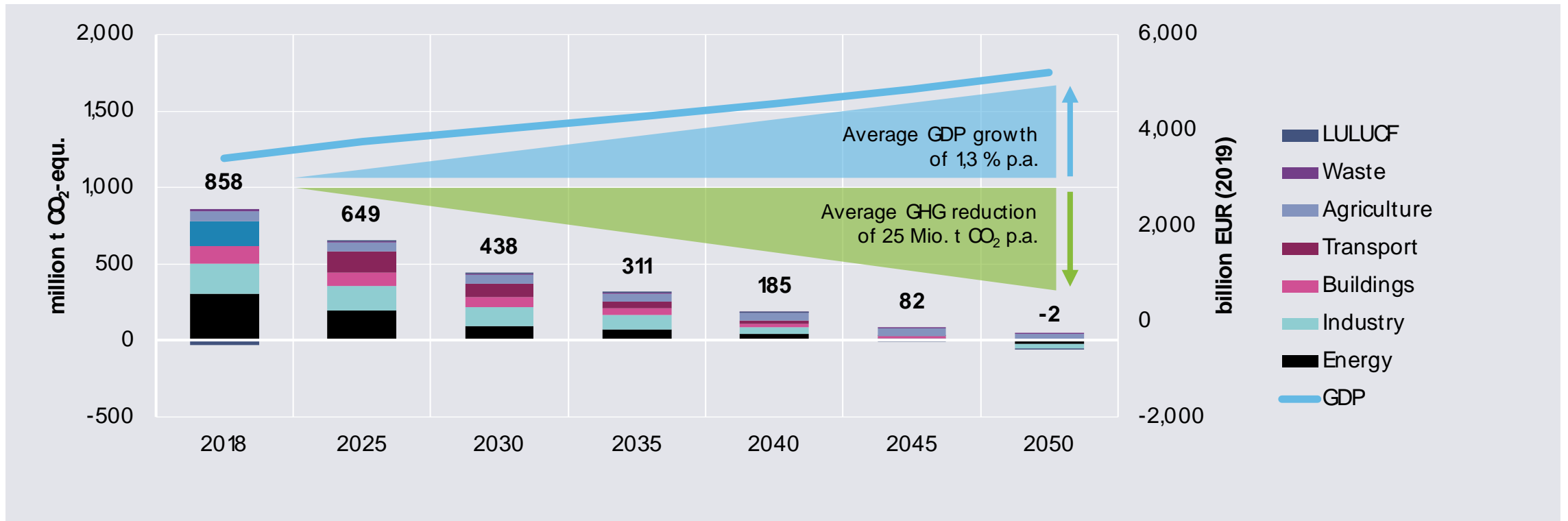
Study on behalf of Agora Energiewende, Agora Verkehrswende and Stiftung Klimaneutralität



- *Towards a Climate-Neutral Germany*
Study on behalf of Agora Energiewende, Agora Verkehrswende and Stiftung Klimaneutralität
- Written by Prognos/Oeko-Institute/ Wuppertal-Institute
- Mission: Model newly set targets of the German government (Climate Neutrality 2050) and the EU (increased EU-2030-target of -55%) for all sectors
- Goal: Present a path towards climate neutrality taking into account costs and acceptancy

Climate neutral Germany 2050 is a growth scenario: 1.3% economic growth p.a, industrial structure remains, 75 Billion Euros additional investments p.a.

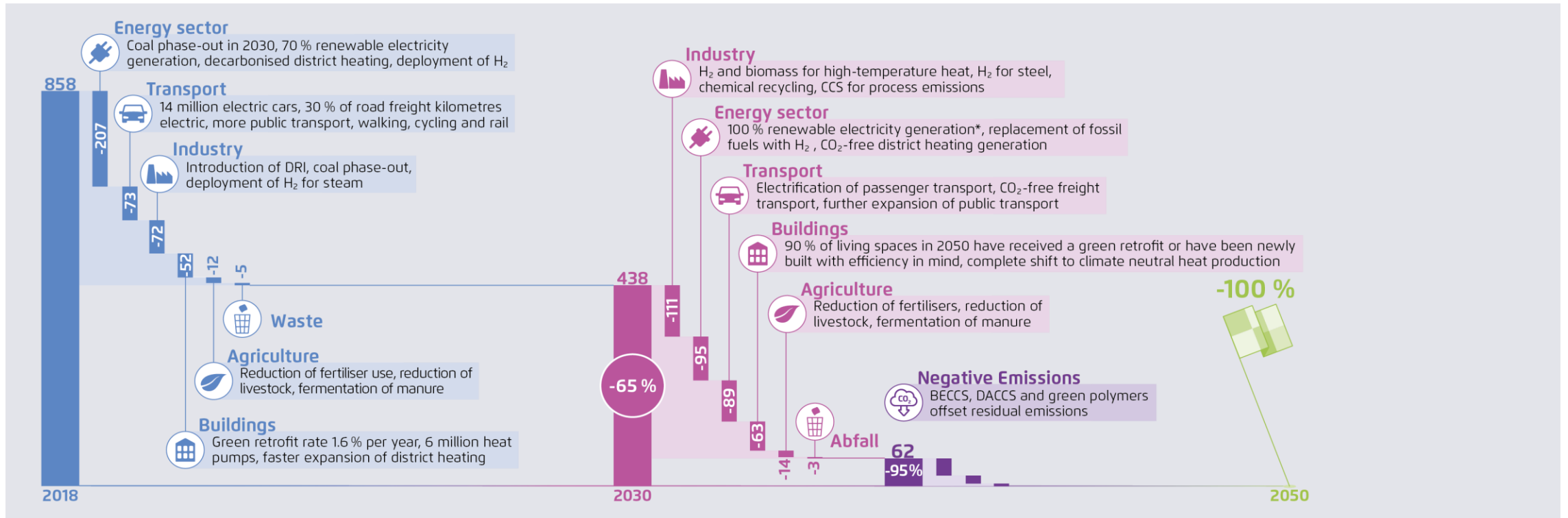
Key indicators of the Climate Neutrality 2050 scenario



Prognos, Öko-Institut, Wuppertal Institut (2020)

Germany can become climate neutral in 3 steps: (1) reduction of ghg emissions by 65% until 2030, (2) -95% until 2050, and (3) CCS for remaining emissions

Measures in the climate neutrality 2050 scenario (KN2050) (GHG emissions in mio. t CO₂-eq.)



Prognos, Öko-Institut, Wuppertal-Institut (2020): Towards a Climate-Neutral Germany. Executive Summary conducted for Agora Energiewende, Agora Verkehrswende and Stiftung Klimaneutralität.

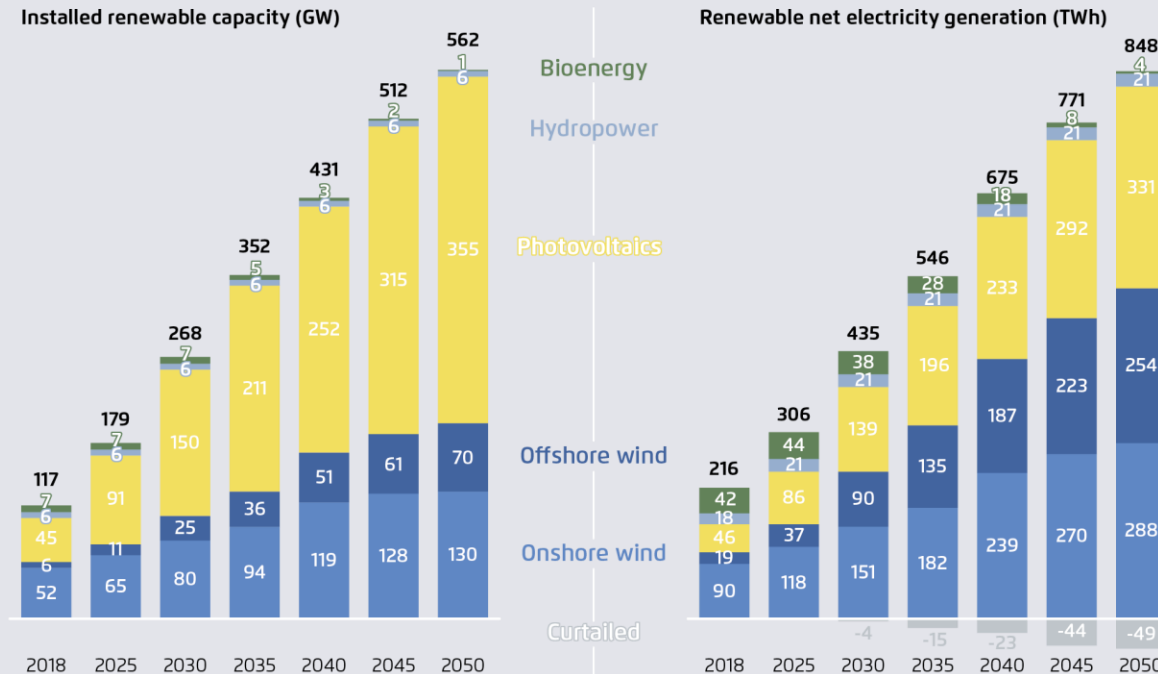


**Five central
strategies for climate
neutrality**

The five strategies for climate neutrality:

Strategy 1: Renewable energies – towards 70% share of electricity by 2030, to 100% by 2050 at the latest...

Power generation



Needed average added capacity per year

Gross increase, for life spans of 25 years

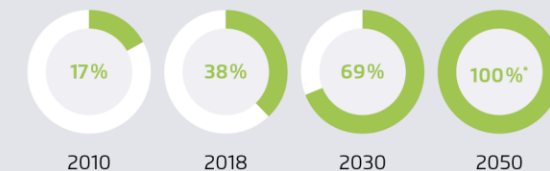
2021–2030



Past years with greatest added capacity:
 Photovoltaics: 8 GW (2010, 2012)
 Offshore wind: 2 GW (2015)
 Onshore wind: 5 GW (2014, 2017)

Cumulative gross increase from 2021 to 2030:
 Photovoltaics: 98 GW
 Offshore wind: 17 GW
 Onshore wind: 44 GW

Share of renewable energy in gross electricity consumption

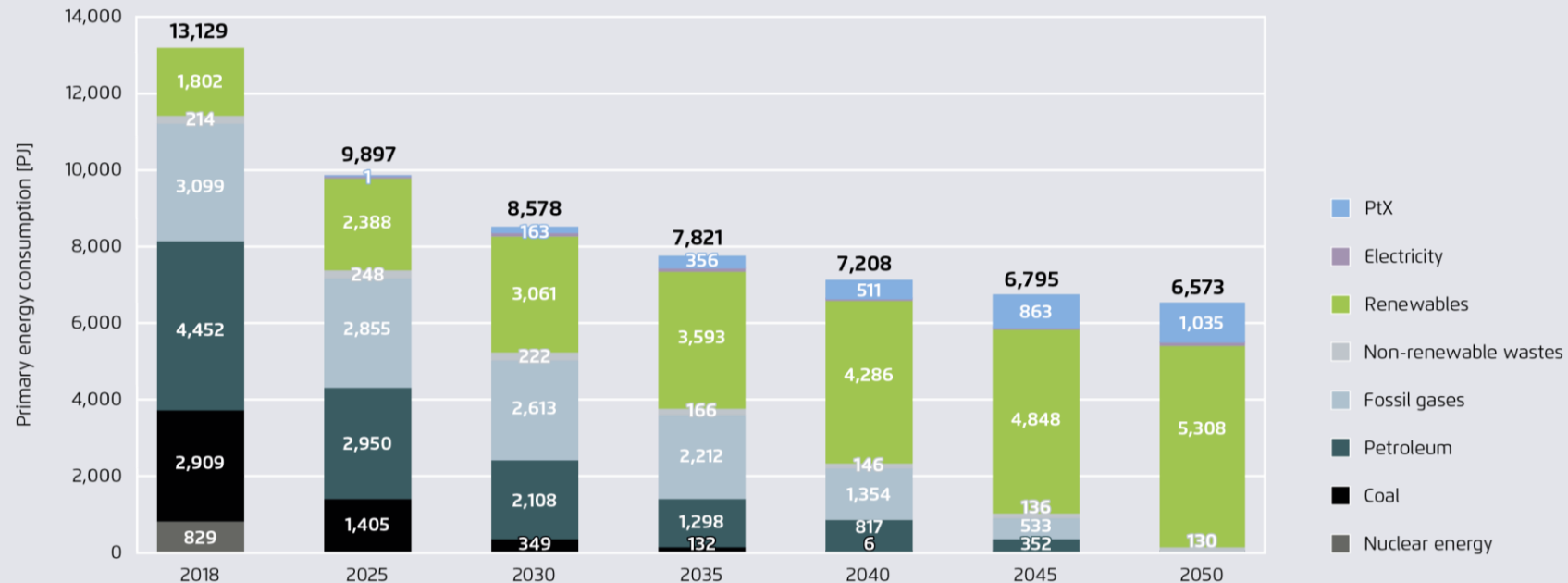


Prognos, Öko-Institut, Wuppertal-Institut (2020): Towards a Climate-Neutral Germany. Executive Summary conducted for Agora Energiewende, Agora Verkehrswende and Stiftung Klimaneutralität.

The five strategies for climate neutrality:

Strategy 2: Energy efficiency – primary energy consumption will be halved by 2050, especially in the heating sector

Primary energy consumption

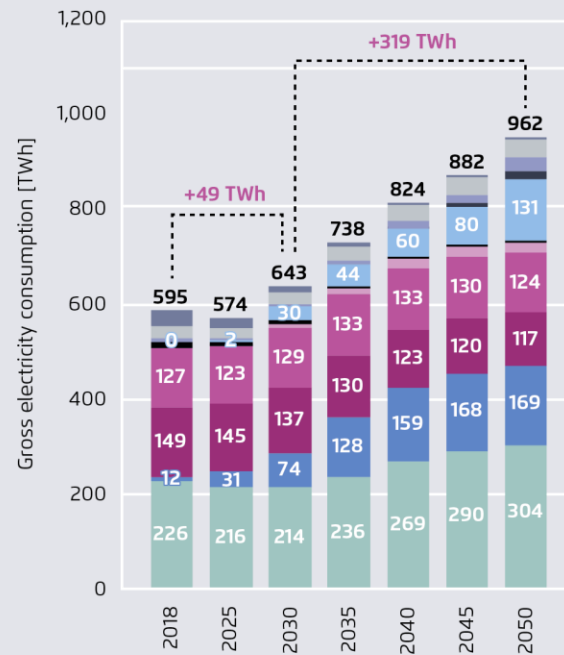






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The five strategies for climate neutrality:

Strategy 3: Electrification – in transport, heat and industry electric cars, heat pumps, electric boilers replace oil and gas

Gross power consumption



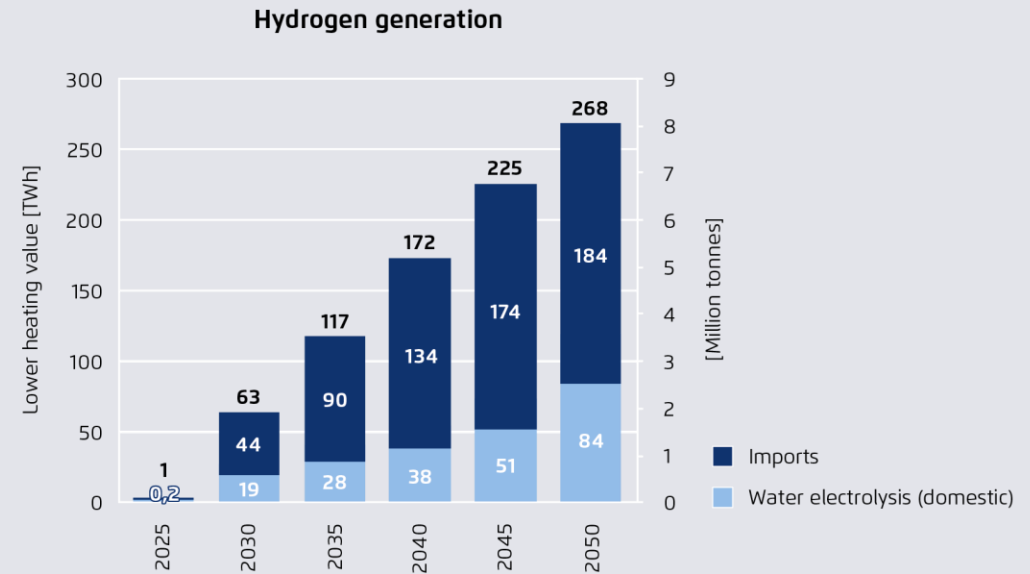
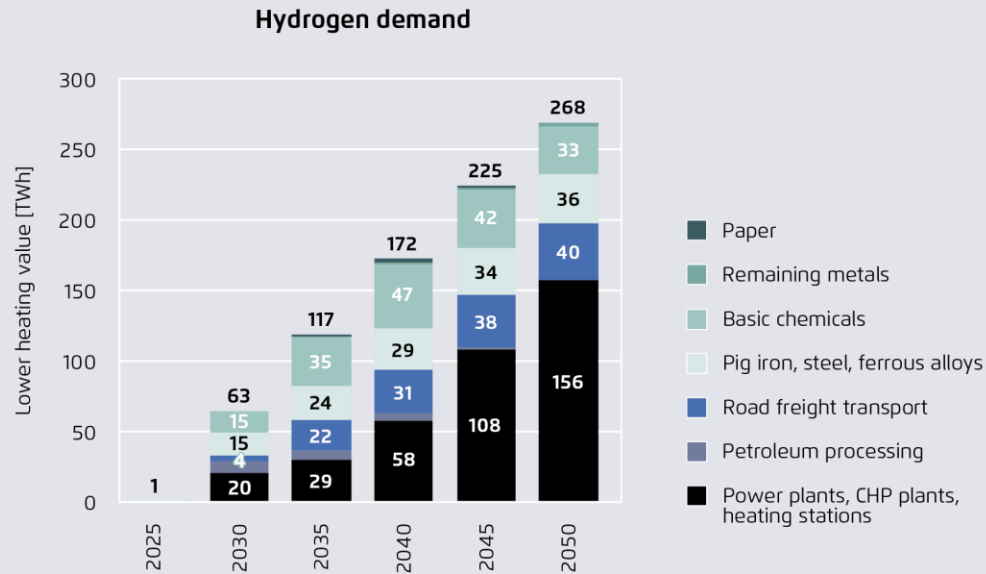
	2030	2050
H₂/CO₂	Production 19 TWh H ₂	84 TWh H ₂ , 19 Mt CO ₂ DAC
	6 million heat pumps, efficient electric appliances, efficient lighting, decline of direct electric heaters	14 million heat pumps, increasing for cooling and ventilation, efficiency with heat pumps, decline of direct electric heaters, efficiency with electric appliances
	Heat pumps, efficient lighting	Heat pumps, efficient lighting
	27% of road freight km via trucks powered by batteries and overhead lines, 14 M electric cars	78% of road freight km via trucks powered by batteries and overhead lines, 30 M electric cars
	Electrification of process heat, electricity-based steam production, efficient cross-cutting technologies	Electrification of process heat, CO ₂ capture, steam production in electric boilers and high-temperature heat pumps

Prognos, Öko-Institut, Wuppertal-Institut (2020): Towards a Climate-Neutral Germany. Executive Summary conducted for Agora Energiewende, Agora Verkehrswende and Stiftung Klimaneutralität.

The five strategies for climate neutrality

Strategy 4: Hydrogen – for safeguarding security of supply in the energy system and to create a climate neutral industry

CO₂ free hydrogen production and consumption in Germany

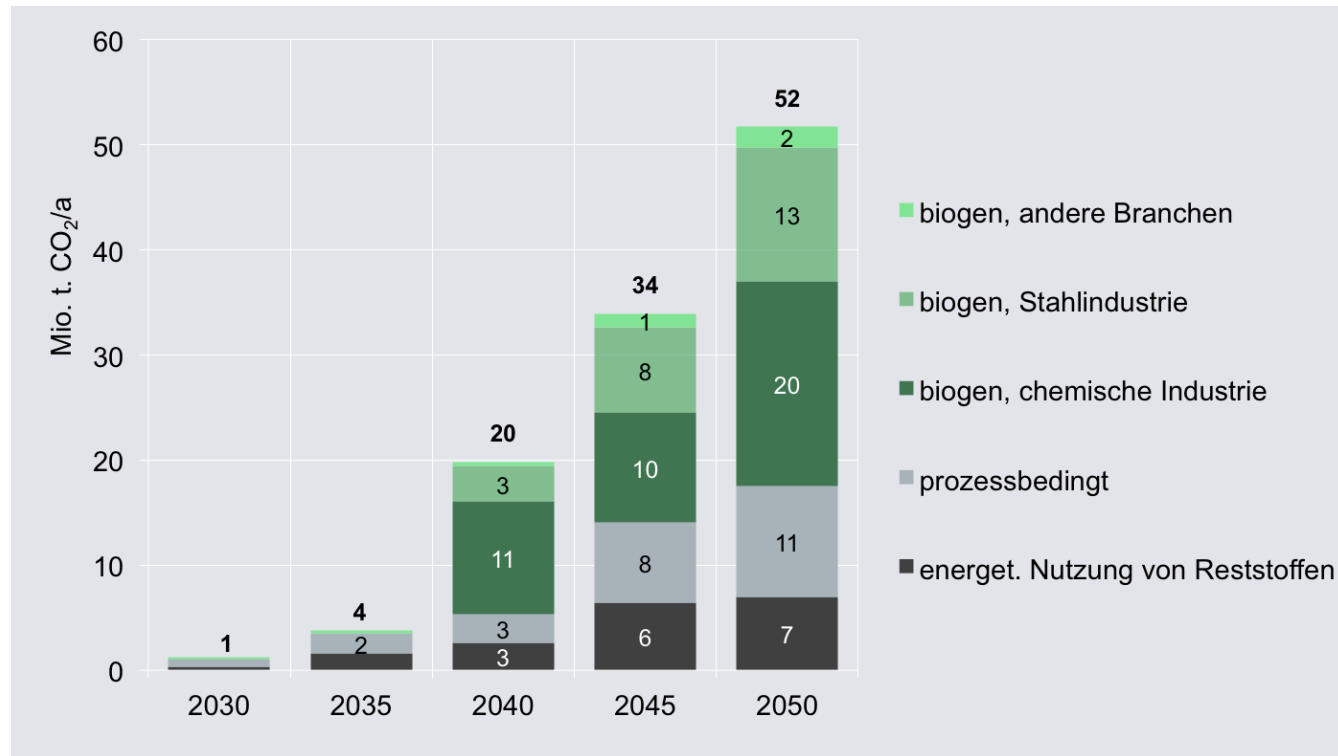


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The five strategies for climate neutrality

Strategy 5: CCS – from 2030 onwards, the ramp-up of a CCS infrastructure (CO2 transport to Norway) will be required

Quantities of CO2 stored by CCS in industry



Prognos, Öko-Institut, Wuppertal Institut (2020)

Steel: BECCS

- Gasification of wood chips on-site for high-temperature heat as well as a carbon supplier (metallurgical C demand).

Chemicals: BECCS

- Gasification of wood chips on-site for steam supply

Process-related

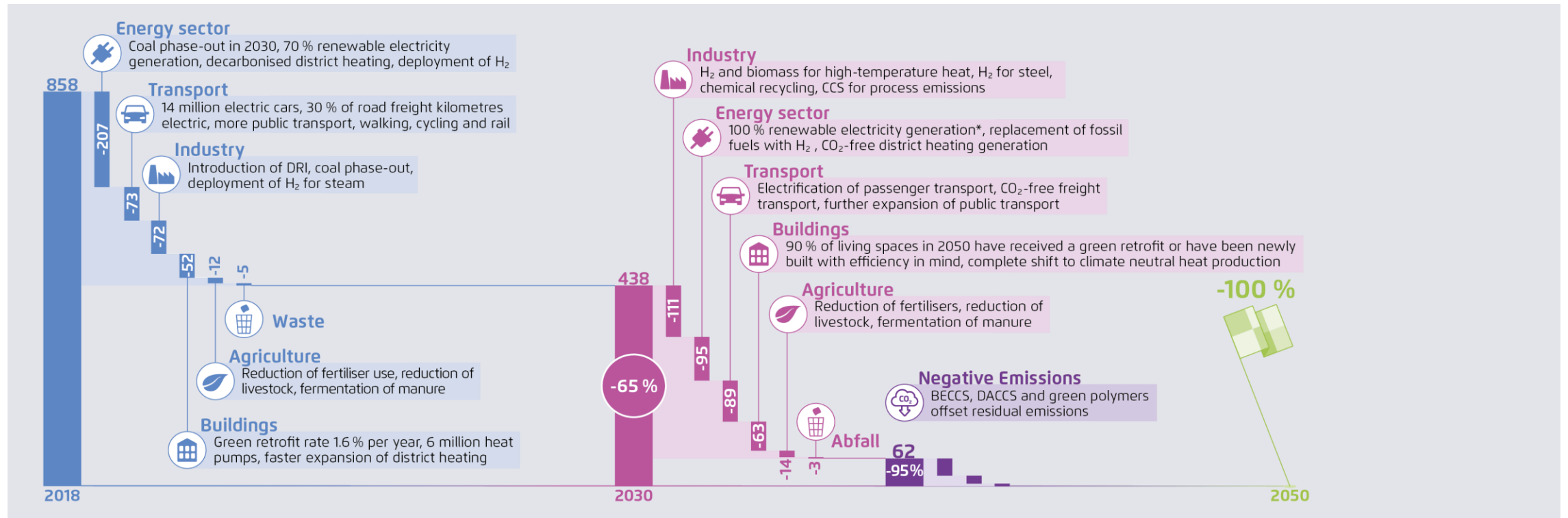
- CO₂ from limestone deacidification
- Process-related partial oxidation of carbon-containing raw or auxiliary materials

Energetic utilization of residual materials

- Use of alternative fuels (cement, lime)
- Incineration of "residual" chemicals

Conclusion: With 3 steps and 5 strategies Germany can become climate neutral by 2050 – and modernize the economy at the same time

Measures in the climate neutrality 2050 scenario (KN2050) (GHG emissions in mio. t CO₂-eq.)



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Thank you for your attention!

Questions or Comments? Feel free to contact me:

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